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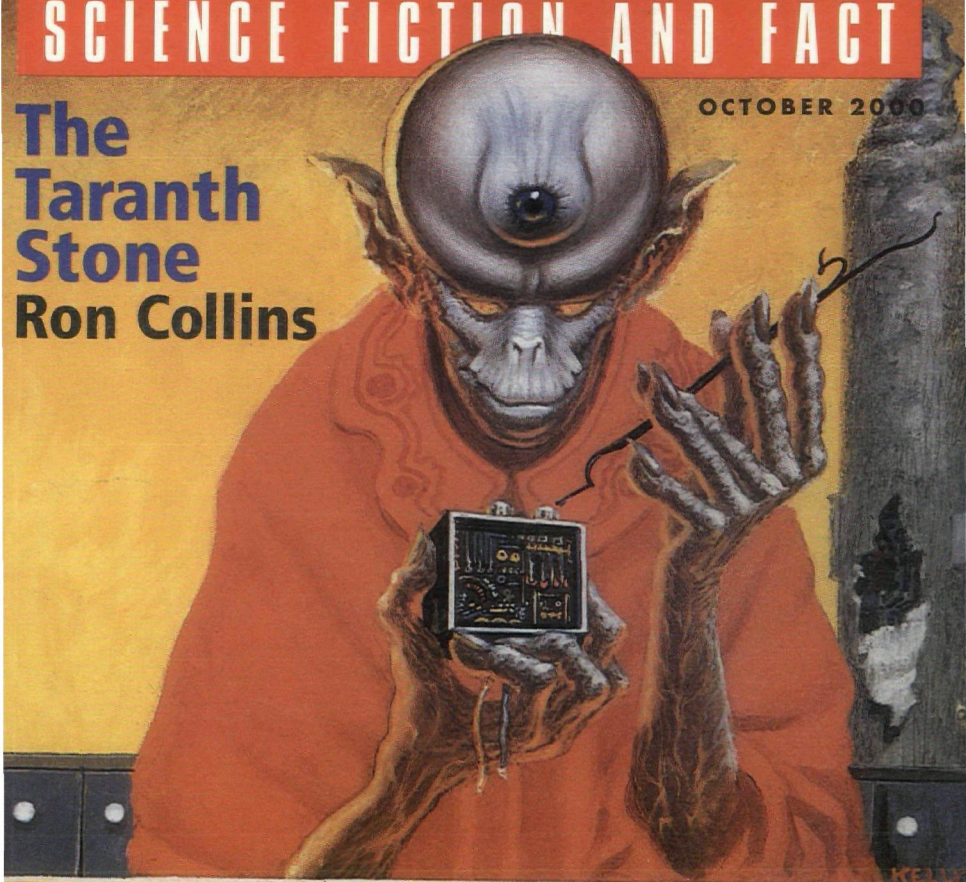

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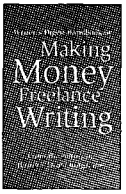

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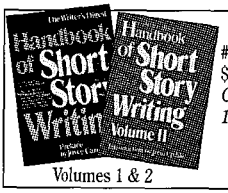

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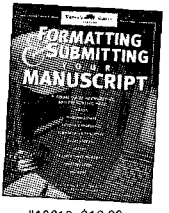

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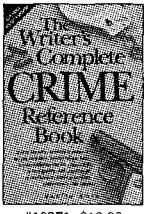

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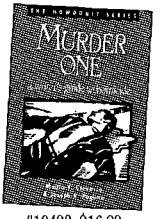

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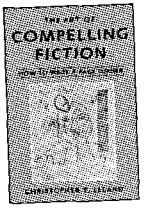

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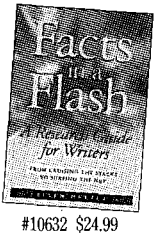

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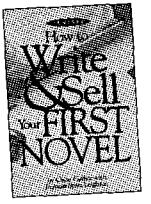

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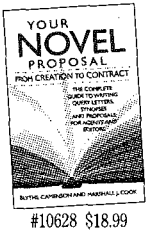

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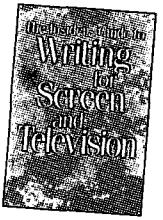

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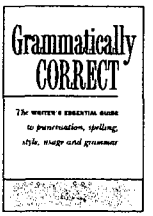

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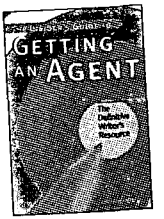

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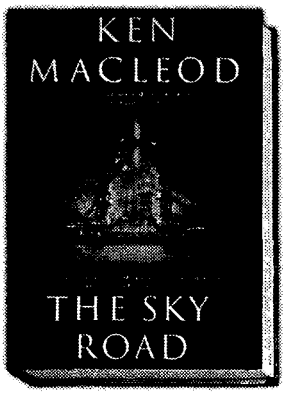

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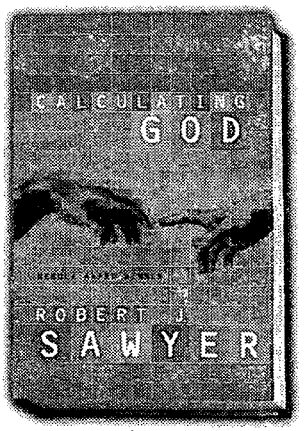

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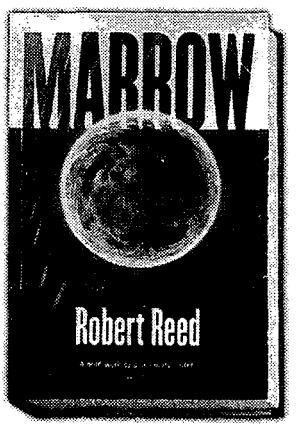

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EDITORIAL Stanley Schmidt

STRESS MANAGEMENT

An interesting recent trend in business management (which I haven't experienced personally but have heard about in several places) is for companies to offer their employees seminars, counseling, or other assistance with "stress management."

Quite magnanimous of them, don't you think?

Well, maybe—but let's consider why stress management is needed, and why business management feels impelled to help supply it. The obvious reason, at least to a cynic, is that stressed-out employees can adversely affect the company's bottom line. One can hope that in at least some cases there's also a second, more altruistic motive: that the managers are genuinely concerned about their employers' physical and mental well-being for its own sake.

In either or both cases, the need for help with stress management would not be perceived unless stress was seen as a prevalent problem—and the reasons for that are telling. Some of them are directly related to the rapid introduction of new technology in the workplace, a trend that shows no sign of abating soon. New technology, even if in the long term it makes life easier, in the short term involves the stress of learning new ways of doing things. How stressful this is depends on how much time is allowed for the process (often too little) and how much methodical training is provided (ditto). And in a time of almost constant "upgrading," it's often hard for the employee who must learn new methods and systems to believe that the trouble *will* make life easier in the long run, because by the time he* feels comfortable with *this* new process, he will likely be told that it's time to start learning the next.

Some sources of stress have nothing directly to do with either new technology or work. These include, for example, a general cultural tendency toward rudeness and lack of consideration, which everybody has to contend with and as a result tends to participate in—a classic example of positive feedback generating more and more of a negative result, with such well-known manifestations as road rage and a widespread scarcity of personal responsibility and reliability.

But many of the most prevalent causes of personal stress not only affect performance in the workplace, but originate right there. I've already mentioned one; and while the epidemic of incivility is in one sense an "external" cause, it certainly affects people at work when they have to deal with abrasive and abusive customers and are expected to remain all brightness and smiles while doing so. Still other problems arise directly and unarguably within corporate walls. The "downsizing" fad (which the social pendulum may be starting to swing away from) has some employers trying to squeeze as much work as possible out of as few employees as possible, with little

*"Or she" is always implied, unless a male antecedent has been explicitly specified.

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THE SCION DOMINION
I
The Power of the Emperor
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or no regard for the impact of that on their personal and family lives or their psychological health.

Some employers are, in deed if not in word, disdainful of the very suggestion that their employees might *have* personal or family lives, or that these might be in any sense as important as their performance at work. Employees being paid far from lavishly for x hours of work are pressured to do $x + y$ without additional compensation, and lambasted for not being "team players" if they balk at doing so. They are overworked, underpaid, undertrained, and shown little respect. I have heard of employees with years of faithful service being required to sign what amounts to a loyalty oath (ironically, in a memo that in the same breath reminded them that all employees must treat each other with "dignity and respect" at all times). As I write this, much of the staff of a hospital not terribly far from my home is on strike, claiming that the administration's offer of "merit pay" is really a way of discriminating against those who speak out against policies that seem to put corporate profits ahead of patient care.

In other words, much of the widespread stress among employees is *caused* by employers, so there is at least a certain poetic justice in their offering to do something about it. Might there also, sometimes, be at least a trace of guilt among their motivations? Or is it just that they want to counteract the adverse effects of stress on productivity?

I won't try to answer that. Nor will I denigrate their efforts; anything that helps is appreciated. But I will ask whether what they're doing is the best thing they could be doing, or goes far enough.

What they're doing is bringing in counselors to work with employees, singly or in groups, to help them learn "stress management"—that is, methods for keeping their stress from undermining their own physical and mental health and their ability to function normally. This is a highly worthwhile thing; since

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sources of stress are everywhere, that skill is one that everyone needs, and it can benefit anyone, on or off the job.

But I respectfully submit that any corporate manager who thinks that hiring somebody to help employees learn personal stress management sufficiently discharges his responsibility to do something about the problem should take a closer look at the very phrase "stress management"—and his own job description. If he is part of corporate management, and much of his employees' stress is produced by the corporate environment, should not corporate management make an active effort to manage corporate stress itself? That is, instead of supplying psychological Band-Aids to help employees deal with the *results* of stress, shouldn't management be looking for ways to reduce the *causes* of stress?

I hold this truth to be self-evident, and it's not hard to find ways it might be done. You could start by simply running down that list of stressors I mentioned above, and thinking about what management could do about each of them. Some of the principles seem quite basic. If a certain amount of work must be done, make sure you have enough employees to do it well. (Note that determining whether you're doing this involves having some understanding of what's involved, at the hands-on level.) Make sure that they're adequately trained in what needs to be done, and in the methods and equipment that are used to do it. When you introduce new methods and equipment, do it again: make sure they're well trained before you expect them to work well or comfortably with the new stuff. Don't keep changing things just for the sake of change or to be "with it"; make sure there's a good reason for any change you make. *Before* introducing a major change in how things are done, talk to the people about who will have to do it—not to tell them what's going to happen, but to ask for their input, and then listen attentively to what they say. They may see important problems with it that would never occur to you, and perhaps suggest solutions—and they'll certainly appreciate the respect shown by your asking their opinion.

Respect is, in fact, at the heart of much that can be done to reduce workplace stress. Any manager would be well advised to remember that the people "in the trenches" are far from unimportant. They're the ones who actually produce what you sell, and without them you have nothing. Let them know that you

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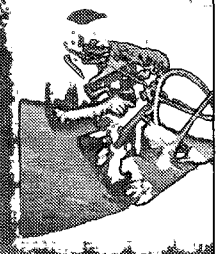

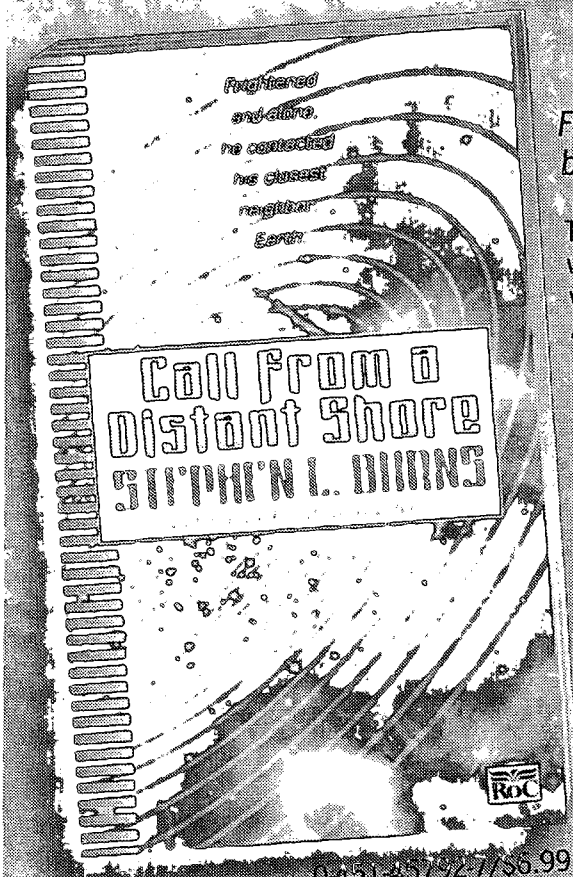

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Some would argue that following such suggestions as these makes sense in the strictest, most traditional business sense: it will ultimately benefit the company's bottom line, because employees who are well treated and not stressed out will be more productive. This may or may not be true—or, more likely, it may be true in some cases but not others. Adequate staffing undeniably requires hiring more people than understaffing, and I'm not sure the cost of that will always be offset by increased profits. But I suggest, heretically, that the bottom line should not be the *only* concern, and that the mental health of the people doing the work may sometimes be more important than maximizing profits for stockholders, or even salaries for employees. Even if squeezing every possible bit of work out of people for as little compensation as possible *does* improve the bottom line, it's simply a wrong thing to do. And ultimately it may not be sustainable. The last time we had an epidemic of that sort of thing, it led to the rise of militant unionism, and I can easily imagine something similar happening again.

Or some other form of adjustment may give employers legal and financial incentives to take a more active role in stress management as I've redefined it. As I was writing this, I saw several newspaper stories about a decision in a high court of New York state granting a man workmen's compensation for psychologically-disabling stress resulting from a series of cost-cutting measures by his employer that indirectly forced him to work extremely long, irregular hours. Inevitably these articles included both predictions that such decisions would force employers to try harder to prevent such things, and quotes from people concerned about how far the principle would be extended. One head of a chamber of commerce, for example, pointed out that it's often easy to see that somebody is physically incapacitated, but much harder to prove that someone is psychologically unable to work as a result of on-the-job stress.

That's true, of course; there's clearly a big fuzzy area, and the potential for abuse. But, as Kelvin Throop wisely observed, "Just because there's twilight doesn't mean you can't tell the difference between night and day." Even though there will be questionable, borderline cases, there will also be situations where courts consider stress damage clear, real, and subject to compensation. I think employers are increasingly going to have to guard against that, through the kind of "stress management" I've suggested.

Continued on page 109

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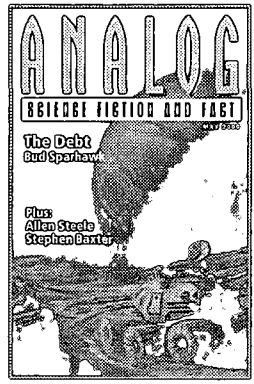

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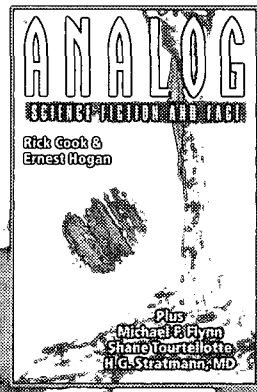

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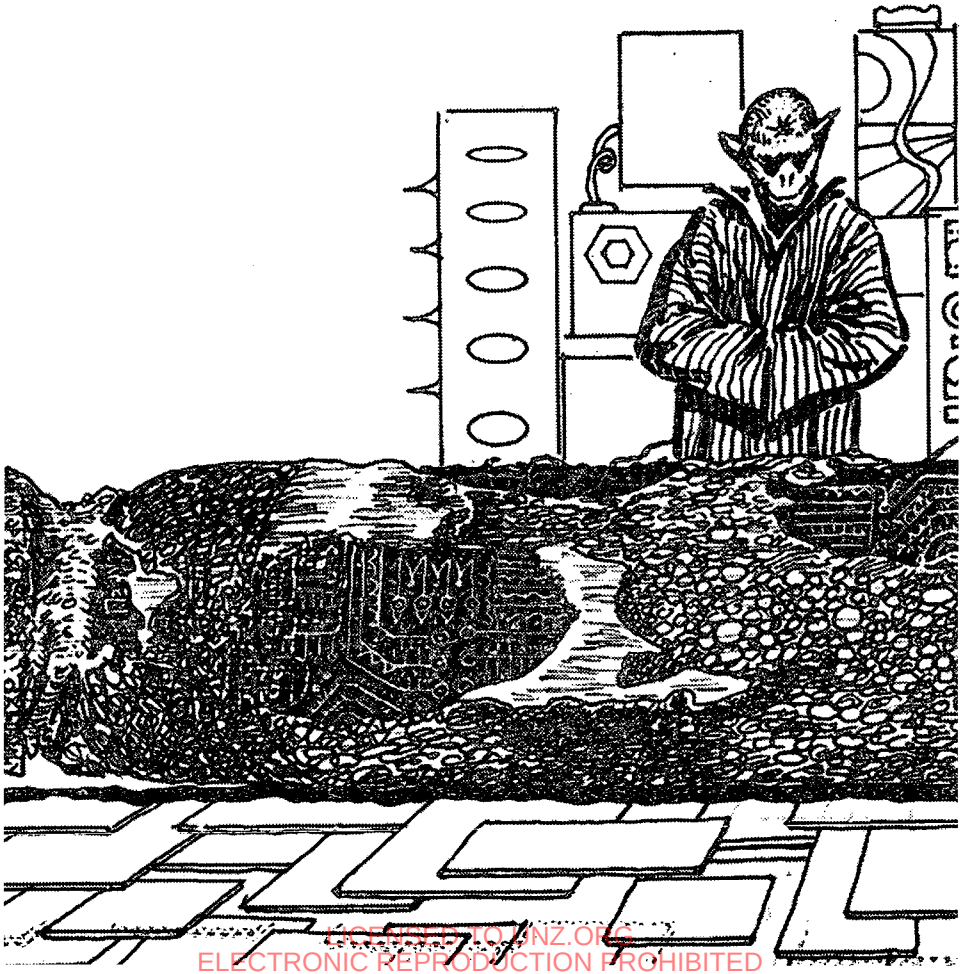

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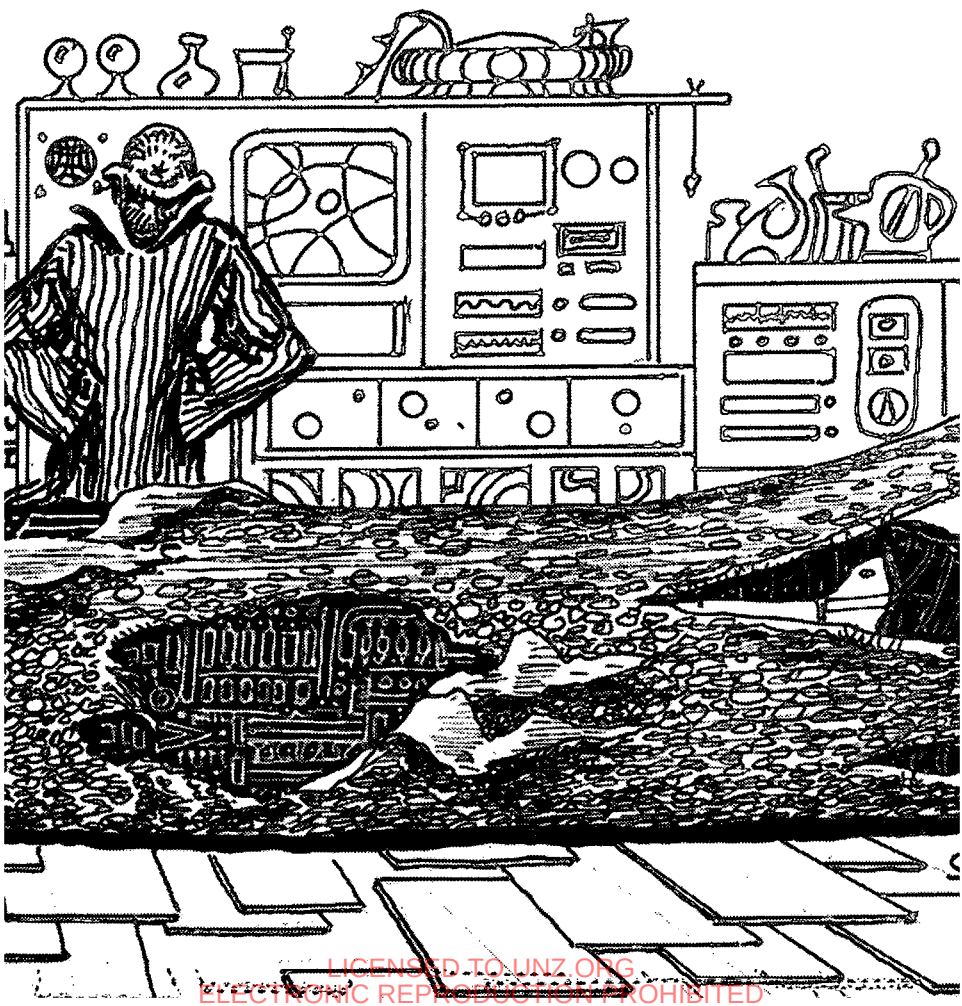
The Taranth Stone

Ron Collins

Illustration by Kelly Freas



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An orange-white umbrella of fire bent from the pod's surface. Brown smoke curled in its wake. The craft was designed to withstand Alpha Centauri A's six-million-degree corona, though, and it survived to glide through the dense clouds of sulfuric acid and corrosive oxides in the upper atmosphere of a planet those from Earth called Eden.

If it were a manned craft, the pilot would have been surprised to find the lowest layer of the planet's atmosphere rich with oxygen. But it was only a programmed machine from a spacecraft that had recently visited the tri-star system.

Pressures as strong as deep ocean scrubbed speed. The pod nosed downward as it drew close to the surface.

Its velocity was forty kilometers per hour at impact.

The ground shook. Rocks and dust flew. The pod crumpled and rolled, flipping end over end like an errant rock tossed down a hill, eventually coming to rest between a pair of basaltic boulders.

The door opened and the chime rang. A delivery runner's engine sputtered as it labored past.

The man who entered Baraq's shop wore the orange robe and obsidian jewelry of the Quadarti Council. His skin was leathery brown and smelled of *kadea* oil. His primaries were yellow orbs of iridescence that blinked in the shop's dimness, and his central was a crystal blue orb high on his forehead that marked him as from the northern regions. He stepped through an aisle, gliding past a row of hand tools. A mobile of *changa* gliders spun lazily near his head.

Baraq's three hearts beat rapidly, chilling his own leathery skin. A hand-tall stack of accounts to be paid sat in a sloppy pile on his counter, and the ledger he was filling was only halfway complete. *Wonderful*, he thought morosely as he looked at the Quadarti. *I needed something else today.*

He glanced to where his weapon lay waiting. It was a recent-model Tegra he acquired in trade for diverting a shipment of root, a good gun with lots of stoppage but less than accurate at longer ranges. Crissandr despised the weapon, of course, and hated that he kept it loaded and in such easy reach. "No one will touch a Waganat," she explained. But desperation leads to a certain lack of caution, and a family name is good for only so much.

There was something else about the gun, too, something he would never tell Crissandr. The gun made him feel independent, his own man, separate from and unreliant upon his family.

The Quadarti guard approached the counter, surrounded by the billowing spiced odor of sulfur and *kba*. He pulled his upper lip back in a smile that showed yellow teeth matching his now slim irises.

"You will come," the man said.

"Good day to you, too, my friend."

"You will come."

"I'm busy," he said, pointing to his paperwork.

"Paper can be shuffled any time."

"I cannot leave. Who will run my business?"

The guard gazed around the empty shop.

"Your aisles overflow with customers. Maybe you should purchase a larger building."

Baraq shrugged. "It is a slow moment."

The guard put four-fingered fists on the counter and leaned forward. His jewelry glinted. The heavy ridge above his primaries drew together, bulging like a distended rock worm.

"You come."

A hackle clawed its way up Baraq's spine. Despite being far down the line of succession, and nearly invisible to his family's power structure, he was still a Waganat. He could send the guard

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away. But the council would make things difficult, and it was best not to trifle with them if it could be avoided.

"Just a moment," Baraq said.

He went to the back of the store and engaged a series of switches. Metal bars fell across windows. Levers clanged into place. He had installed the device during the last Convergence, when the heat light of Eldoro and Katon filled the sky together in the daytime. He remembered the timing because the clouds had thinned then, and the temperature had dropped so far that water actually formed on the ground in the mornings.

"I'm ready," he said.

The Quadarti guard nodded, then led him away.

The council chamber was a tall, rounded room that smelled of influence and was ringed with columns of gray-veined basalt that rose to an open-air ceiling. It was midday of Katon Leading, and the smaller of the two heats was a hazy blot glaring through the domed opening. Eldoro had risen, but was too low to be seen in the chamber. The floor was flat rock inlaid with a spiral of shining obsidian from the foothills of Holy Esgarat.

Baraq had expected to see the council in session.

Instead, only Councilor Hateri greeted him, his ceremonial robes wrapped about him as if they were armor. His hairless skull was nearly perfect in its roundness, dimpled only at the back of his parietal temple. His primaries were pinpoints of darkest brown, and his ear flaps drooped slightly at their ends.

Baraq kept a disdainful grace to his stride despite his hearts' pounding. "What do *you* want?" he said.

"Good day to you, too," Hateri replied dryly.

"You are the last councilor I would expect to arrange a personal meeting with a Waganat."

"Come, Baraq. Let's not get mired in trivial arguments."

Hateri was a proponent of Quadarti regulation. Every session saw him propose new constraints on trade, and new taxes on materials.

"Open trade may be a triviality to you, but it is life to me."

The councilor's face betrayed no emotion. "I'm sure the Waganats would get along under any laws set forth."

"What does my family have to do with this?" he said with more anger than he meant to reveal.

"Nothing, Baraq. Absolutely nothing."

"Well, then, what *am* I here for?"

Hateri motioned with one arm. "Follow me, please."

Without waiting, the councilor stepped into a long hallway. Baraq followed in uncertain silence. The guard's sandaled footsteps rustled behind. After several corridors, a lift ride to lower levels, and more corridors they came to a set of double doors that led to a small room filled with cabinets, a long table, and several chairs. A row of brown smocks hung from hooks on the wall.

Hateri motioned Baraq forward.

The guard remained behind as Baraq entered.

"Grab a covering," Hateri said, pulling one over his robes, and putting a key to another door.

Baraq felt like a child as he did as he was told. That was his lot in life. Do as you are told. Follow in the lines. He was well past half-age, well past the time when he might do something new, past the time when people expected brilliance.

When he was ready, Hateri pushed the last door open.

A dry, camphorous odor came from all directions. The lab was almost as large as the council's chamber. But where the council's home was garnished and ancient, this room was an austere grid of tables, machinery, and test panels with rows of glass bulbs glowing xenon colors. Diagrams and sketches were gummed to the walls.

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But the item that drew his attention sat on a long row of eight tables lashed together. The thing was huge and brown, long and rounded, easily eight to ten times as long as Baraq was tall.

He stepped forward.

Its shell was pebbled like a stone lizard's skin, broken and torn apart in places. Fine igneous dust covered much of the body. Inside were boxes with green and white and black wire protruding from them.

"What is it?"

Hateri's grin was bright as Eldoro at midday.

"Can you not guess?"

Its shape was sleek and bulletlike, its nose smashed, its tail open and blackened. Baraq's hearts pounded. He tenderly ran a webbed finger along the thing's surface.

"The Taranth stone?" Baraq said.

Hateri nodded, obviously enjoying Baraq's expression of incredulity.

Maybe thirty years ago, a searing ball of flame was said to have scorched the nighttime sky over Esgarat. The council had sent a party to search for it, as had the Waganat family. But thirty years ago, their machines were unreliable and almost incapable of making the trip. By the time they arrived, the mountain's volcanic landscape had shifted to cover whatever secrets the site might have provided.

That didn't stop rumors from building, though.

Esgarat, the tallest mountain peak on the continent, was thought to be the place their species first emerged from the caves to walk the surface. It was no surprise that the holy light landed there, priests proclaimed. It was only fitting that the Gods would send fire to the place of all Quadar's origin. Some churches said the light brought Eldoro's power and had the ability to strike down enemies with rays of death. Scholars debunked those claims and suggested the ball of flame was more likely just a trick of the clouds, reflecting distant firelight in a spectacular fashion.

Amid the heated spiritual battles was another intriguing story, one that said a villager named Taranth had found the remains of a great stone and hauled it to a place of safekeeping.

"How did it come to be here?"

"The truth?" Hateri said.

Baraq gazed at him, his central expressing impatience.

"We've had it here since the first expedition."

Baraq's central whipped directly to the councilor. "You've had it here all along?"

"We wanted to study it."

"Likely story."

"But true, nonetheless."

"Whatever you say." Baraq fought a flickering anger. Bureaucracy delays progress, and this was among the more egregious examples. "The end result is still withholding the existence of the stone from the public."

"It's not a worse deal than your family would have given."

In that, Baraq had to admit the councilor was right. His family developed technology and sold it to the highest bidder. It was an ugly field, one that made him uncomfortable every time decisions were made that tied progress to financial rewards. The family was really no better than the council, withholding beneficial inventions until the price was right.

"Why am I here?" Baraq answered.

"Why do you think you're here?"

Baraq thought for a moment. The room hummed with the heavy sound of a floor fan. The lab was empty, he realized. No one was working.

"The thing is obviously a device of some sort."

"True," Hateri replied patiently.

"So, somebody had to make it."

"Again, quite astute."

"You haven't been able to figure out how it works," Baraq said, the truth dawning.

Hateri smiled. "We've made progress,

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of course. Instructor Geldour-enet and his assistant have learned much about its aerodynamics. The university is working with an advanced heat-bearing composite based on the outer shell's chemistry, and we've got a student developing approaches to power generation based on the system's configuration."

Baraq focused his central on the councilor. "What kind of power systems is he creating?"

"I'm just a politician, Baraq. You'll have to ask someone who understands all that."

"So, what's the problem?"

Hateri sighed hollowly. "The problem is us, Baraq. The council can no longer agree what to do. Jie-Kandor of the Soundt will not accept less than debating where we send each subsystem for study, then he bogs us down with reasons why his sector should do all the examinations. Obala e'Lan of Esgarat thinks that, as the device came from her region, her scientists should be allowed to discover how the device works. The aligned churches want merely to bury it—although the Prime Dias of Eldoro sees it as proof that the creator exists outside the sky, and is petitioning to use it as an icon for his services."

"And all the while the system sits waiting."

Hateri nodded. "And just as important—every day we lose in determining how it works leaves the people who made this that much further ahead of us."

Baraq gazed at the councilor, sensing something deeper to his comment. "You're afraid of them, aren't you?"

"The council has searched everywhere, Baraq. We thought we knew everything about the world. We thought we had discovered all there is to discover. Now we find a device of mysterious power developed by someone we cannot find. Wouldn't you be afraid?"

"What do you want me to do about it?" Baraq said.

Hateri's pupils gleamed blackly in the room's light. "I can arrange to ship pieces of the device to you. I would expect you to use whatever contacts you think are best for whatever study you undertake. I want you to discover what you can."

The device lay on the table before him. Baraq could almost hear it whisper, luring him, seducing him like rock fates tempting Drath in tales his mother had once told him. Reason spoke inside him, though. The Waganats did not develop technology for any but themselves. It was more than a policy. It was an oath that ran in his family's veins as surely as did their blood. If he took this job, it *would* cause a rift.

"My family—"

"Your family is there, and I expect you will use your connections wisely. But given what I've said of the politics regarding the device, you see why they cannot participate."

"No, I don't."

"Your family would attempt to control its results and would hold its benefits ransom."

Baraq was taken back. "Why me, then?" he asked.

"You're a good man, Baraq. You care about our people and you respect technology. In that sense you are better than the rest of your family, you know?" Hateri's expression grew serious. "Look at this device. You see what it means, don't you? You see how much we can gain from it."

Baraq never cared for politics. What he loved, what kept him rising from his pallet every morning to work in his grungy little shop, was understanding how things worked. Now Hateri was offering an opportunity to study what was quite possibly the technological discovery of their species' history.

The image of his father flashed into Baraq's mind. He shouldn't do this. But he thought of returning to his shop to face the pile of bills. The Taranth stone

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lay before him, making his hearts pump blood chilled with acid energy.

"I'm sure we can work something out." The words slipped from his tongue before he realized he had thought them.

Hateri left him with the Taranth stone for the rest of the day. Baraq poked and prodded and studied diagrams. He devoured the layout, elegant in its own fashion, trying to understand the minds of the people who did this. The way the wiring ran and looped described them as efficient but generous. The way the system's weight appeared unevenly distributed judged them perhaps a bit hasty in their action. The sharp flavor of knowledge oozed from every component, a taste full of intrigue and fear and flat-out envy.

He considered keeping the study to himself. He wanted to do it, of course. But it was obvious the technology was beyond his capabilities. Hateri had chosen him more for his contacts than his skill—a fact Baraq found he could suddenly live with. The people he chose to work on this would have to be the best in their fields, and they would have to operate under the guideline of silence until the entire effort was finished.

By the end of the day, he knew what he was going to do.

One of the more interesting pieces of technology he could see was a series of smooth-walled chambers connected by necked orifices. The assembly filled the rear of the device. This, Baraq would give to Kaatla Regonar. Kaatla understood engines, and he was pioneering a flying craft, and Kaatla knew how to be silent when the time came.

A box filled with metallic etchings and red, black, and blue wafers would go to Estaut, a friend of Baraq's from his university days who had designed electronic circuits almost from the day he was born.

And finally, Baraq would provide the last item, a package that had been bolted onto a sliding bay door in the Taranth stone's underbelly, to Louratna. Its cylindrical system was made of a white material he had never seen. Inside were more of what he took to be electronics, and a collection of hourglass-shaped components linked like wheel spokes. A cracked light bulb sat in the center, and a twisted ring of tarnished metal wrapped around the wheel's circumference giving the hourglass components bare clearance.

If anyone could figure out what this was, it would be Louratna, an old woman who had taught him more than he could ever truly understand.

Eldoro's heat was a red blot on the horizon when Baraq finally went home. The clouds had broken on the dark side of the sky.

Until a year ago, the clouds had been a constant, never-changing blanket—light tan and gray in the heated hours and an inky brown in the darkness. The heats of Eldoro and Katon were thought to be just that, massive blobs of energy that floated through the clouds like a fish swims in the sea. But that changed when the clouds parted.

The first rending was cataclysmic, bringing life to a halt for days as people cowered in their homes. That it occurred in tandem with the melting water from the sky—drops laced with acid that slowly burned through houses, destroyed plants, and ate away flesh with agonizing pain—made the hysteria worse. Tiny Eterdane had been discovered then, a new heat too small to burn through clouds but far larger than the other points of light revealed by the parted clouds. And Eldoro and Katon were revealed for their true nature, massive balls of flame behind the curtain of clouds.

Now Eterdane gleamed in the blackness amid hundreds or, if philosophers were right, thousands of other glimmering points. Everything was changing now. Some philosophers were suggest-

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ing that perhaps Quadar was the object that moved, not the heats themselves. One thought in particular was that both Quadar and Katon circled Eldoro, giving rise to Eldoro's smooth path in relation to their home, and the more erratic movement of his sister. It was dangerous to put too much weight behind a philosopher's opinions, though. They tended to extrapolate answers from outside of the known, sometimes making claims as wildly unsupported as those of the church. As such, mainstream scientists viewed them with dubious eyes.

Still, Eterdane's appearances drew crowds, and as usual, a gathering stood on a slope of basaltic rock, staring at her with slack-jawed wonder.

"It is a new day, I say. A Holy day," a woman in white robes said from a hastily constructed podium. "Three heats for three hearts. Come with us as Eterdane grows to her rightful place and takes her seat with Eldoro. Be blessed in the growing warmth of our Goddess as she replaces Katon."

Rubbish, Baraq thought, scowling.

He had no place for such misguided hash. That there were three heats had nothing to do with the fact that they had three hearts. The world was hot, and a Quadar's blood was used both to pass oxygen to the body and to cool it. Each heart absorbed heat and returned it to the atmosphere via plates on the Quadar's shoulder blades. Everyone knew that. If a single heart failed, the Quadar was more likely to die of heat exposure than of a lack of oxygen.

Still, people gathered around the priestess, nodding at her distortions.

These were strange times.

Things were changing, and he understood people trying to grow comfortable with what it all meant. But he couldn't help being upset at opportunism that sprang up so readily. He had heard everything from religious portents like this woman's preaching, to raw environmentalists who screamed of global cooling and oceans of burning acid. Philosophers extrapolated the existence of other worlds and talked of travel to them. Beleaguered scientists, of course, were just trying to figure everything out.

Baraq's money had always been on the scientists.

He glanced at Eterdane. They knew precious little about her. It was a small heat, unable to be observed except during brief moments when the clouds parted in just the right way. But they had been able to ascertain that Eterdane's movement was erratic and similar to Katon's, not circular about Quadar as Eldoro's was. And, the priestess's ranting prophecies notwithstanding, Eterdane seemed to neither grow nor fade.

Baraq was too tired to think about it right now, though. But despite his fatigue, he couldn't stop his mind from filling with images of the device hidden in the council's network of buildings, running with memories of wires and boxes and materials that he had never before seen. For the first time in a very long time, Baraq realized he was humming.

He went straight to the kitchen.

"I'm glad you made it home," Crissandr said. She was seated at their table, reading.

He smiled. "Me, too."

No matter what happened throughout his day, a single word or sometimes merely a glance from Crissandr made things better. She wore a red haldi, a robe like dress that clasped at the side. Her central was flecked with green, and her head and face were rounded and perfectly formed, her lips full and graceful in the manner of females.

"There's *havra* and *jaran* in the box."

He pulled his dinner from the retainer. "How long ago did you eat?"

"A while. I was hungry. I'm sorry I didn't wait."

"I'm glad you didn't."

"Working on something important? Or did you just get caught up and lose track of time?"

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He chewed his food, savoring the coarse taste of the *havra*. There was something about Crissandr tonight. Her face crinkled with an anxiety he could spot from paces away.

"What is it?" he asked.

Crissandr put her book down and took one of his hands. Her eyes softened and her irises dilated.

"We're going to have a child, Baraq."

Hara ran toward him, her tiny arms outstretched. She jumped, and he caught her, swinging her in the air as she giggled. She had been only six.

"You saw her just then, didn't you?"

Baraq drew a breath. "Yes." He didn't tell her that his next thought was of the family—his father parading over his child's *jahalarat*, overseeing the process of bringing another Waganat into his clutches, looking at the child like the prospective laborer it would certainly be, like another of so many slaves.

"I think it's all right, don't you?"

He closed his eyes, surprised at the crispness of his memories. He could still feel his daughter's tiny body against his chest. She had been dead for over three years. "Not a day goes by that I don't think of her."

"Me, too," Crissandr said, her voice wavering between anxiety and guilt, her central clouding.

When he was younger, he would never have understood the power he had at this moment, the ability to crush his mate with a single word or to raise her up with a mere glance. The muscle over her brow was tight, and her lips were now drawn and bloodless. But hope flooded her primaries, and she held her body upright and forward, bold and proud like a warrior marching.

He nodded and smiled warmly. He kissed her lips, tasting her fear as it slipped away.

"It's better than all right."

Inside, though, his stomach twisted and he felt the clutches of his family name, saw images of Hara, and oddly—so oddly—smelled the arid chill of skies littered with blue-white pinpoints glimmering.

* * *

The year moved through Divergence—when Eldoro and Katon ruled opposite sides of morning and night—to the time of Eldoro Leading, when the heat of that god rose early to be chased through the day by his smaller sister.

Crissandr began to show signs of their child. They did the sacrifices, sixteen bows to the greater heat and eight to the lesser, to ask aid in preparing their home for the child's arrival. They attended a family outing, Baraq cringing when the topic of the *jahalarat* was brought up.

Part of his discomfort was the Taranth stone, of course. He studied it at night when he could slip away, deciding that the next piece of technology he looked at would be a device that appeared to shoot light into another box of electronics. He wanted to talk to someone about it. He wanted to share the wonder of his findings. But his first three experiments were not complete, and he didn't want to stretch himself too thin.

So he waited.

He was repairing a wall in his shop when he learned Kaatla Regonar had crashed and died in one of his flying machines.

Kaatla had briefed Baraq on his progress the week before. The system, he said, was designed to push the Taranth stone through the air at great speed. The basic dynamics of the process was similar to, but different from, those that propelled a bullet from a gun: fuel burned in a small compartment exhausted through a nozzle, resulting in a force in the opposite direction. Still, the equations that governed the process remained a mystery, as did anything about what kind of fuel the device used. Kaatla had sent a sample of the inner compartment to a lab for analysis, but had not heard back at the time of their meeting. In the meantime, he was experimenting with his own

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shaped chambers.

Kaatla's death was a setback, for certain, but Baraq thought nothing strange about it at the time. Kaatla was a risk taker, a trait that made him the inventor he was. He had been working on his flying machine for years, and people had been predicting a broken neck for him for just as long.

But three weeks later, Estaut's mate found Estaut floating in an underground pool.

He, too, had just briefed Baraq, reporting that the wafers seemed analogous to the Quadars' own component-driven electronics, and that microscopic examinations of each component revealed a vast collection of circuitry. He had been able to excite small pieces of the device, but had no way to probe the wafers themselves and did not understand how such a component might be built. The next step would be running studies of the silicon-based material to see if something could be learned from it.

But Estaut was dead the next day.

A cold shiver came over Baraq.

He went to the room where he had heard from both of the now-dead scientists. A round table sat in the room's center. He stepped quietly about, looking under the table and chairs, and lifting decorations from the wall. He found what he was looking for behind a rendition of the legend of Eldoro chasing Katon from the sky with bolts of blue lightning.

A wave talker was embedded in the middle of the lower frame rail, placed there so as to avoid throwing the image out of balance. Wires led to thick battery packs in each corner.

Ironic, he thought. The rendition had been one of his personal favorites. Now it was forever ruined.

Two men were dead because of him.

And he knew exactly who had done it.

"You killed them," Baraq said, controlling his anger.

His father folded his hands over his belly. His face was rounded and jowly, his skin hanging from his cheekbones like molten slides of flesh.

"Why do you say that?"

"Because they both died shortly after briefing me, and because of the talker you have in my office. No one else has wave talkers, Father. I'm sure you understand that."

Some years ago, Jarka'el Waganat, Baraq's cousin a few times removed, had developed a machine that sent and received encoded waves of energy that could be descrambled with an appropriate receiver. It was a monstrous machine that created waves of incredible power. He demonstrated the device by sending a message asking his spouse to make *havra* stew for dinner. The family's fortune had been made through negotiations, and they didn't need schooling to recognize power in the ability to speak rapidly via invisible waves.

In a discussion that raged for weeks, the family decided to keep the wave talker for themselves rather than sell it. They improved it over time, learning to boost power and focus the waves and learning to use higher frequencies where waves could be made to carry voice more readily than the irregular, spark-generated waves of Jarka'el's first machine. They doled out systems when it suited them, using wave talking as bargaining levers for critical contracts and other business advantages.

"You should have known better than to develop technology for the council, Baraq," his father finally replied.

"It was work."

"You should have come to me."

Baraq remained silent.

"We've had this discussion before, Baraq. You have your business because of the family. You have your life, your wealth, and your home because of the family. Don't choose this time to forget that."

I'm drowning, Baraq thought. *As cer-*

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tainly as Estaut did in the caves, I'm drowning. He was far removed from any real power, but there was nowhere to swim away from the family. He thought, for a moment, of telling his father off. He thought of exposing him, going to the public with the existence of this glorious device.

"You will tell Hateri that you can find nothing of worth."

Baraq's stomach dropped. "You know who funds me."

His father gave a nonchalant shrug. "Hateri will be discredited shortly."

"What do you mean?"

"You think the rest of the council doesn't know he's broken from their ranks?"

"You told them?"

"That's what partners do."

The sentence settled fully.

"Does that surprise you?" his father said.

"No. Not really." Baraq's insides tried to rise up and clog his throat. A fire burned over his skin. For much of the past year he had felt alive. He was studying the Taranth stone, doing something important. And for once he was working on his own. At least, he thought he had been. Now he realized once again that he was no more than a sandworm. Useless. Meaningless. Removed from the structure of his family, unable to affect its decisions, unable to break from their clutches, and too weak to buck them.

"How big a cut do they get in return for laws that keep others at bay?"

His father laughed with a smile full of yellow teeth. "You have grown into a good businessman, Baraq."

"How big?"

"Big enough."

Baraq considered recent events. How much did his father know of Louratna? She did not travel from her home and would not visit his office, so their discussions had been away from the prying wave talker.

"So, two men are dead, and you will discredit Hateri."

"Yes."

"What about me?"

"What about you?" His father's eyes were level and unwavering now, their challenge firmly placed. If Baraq let this go, he would live. He could continue to run his shop, continue to go home each day and sleep each night. But the family would protect itself. Wave recorders. Spies. Inspections. He would never know from one moment to the next when someone was watching him. And if he did not let this go, Baraq saw the result in his father's eyes.

The Waganats were not above disposing of their own if need be.

"What will happen to the Taranth stone?"

His father smiled. "Do not fear, Baraq. We will continue the investigation and will bring any useful discoveries to market, just as we always have."

"I understand, Father." And he understood something else, too. His father, he realized, did not know of Louratna's work.

Crissandr's belly swelled as the days passed.

Baraq worked in his shop, selling automatic door openers and machines that served food. Each transaction sent money to the family and a slice to the council. With every good sold, Waganat control fueled more Waganat control.

He wanted to contact Louratna. Every day he told himself that he would try, but someone from the family was constantly loitering around his shop, and he told himself that he could not risk causing Louratna a similar fate as Kaatla and Estaut. The truth, though, was that he was more afraid for himself than for Louratna.

Days passed. Katon caught slowly up to her brother, bringing in Convergence, the time when their heats were as close as they would get throughout the year. He walked home under night skies that were cold and occasionally cloudless,

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and with hearts that were equally empty.

It was on such a night that a dark form stopped Baraq.

"Come with me," it whispered with feminine softness. She grabbed his arm and pulled him along.

Baraq's hearts pounded. "Why? What's going on?"

"No time," the intruder replied fervently. "Come now."

Baraq soon found himself in the small candle-lit cellar of a shop.

"Louratna," he said.

She sat behind a simple table, wearing a headdress of twined *kava* that rested on her knobby head in several places. She looked at him, complete with her unshakable demeanor, as if they were merely sitting together in the middle of the bazaar and not as if he had just been essentially kidnapped.

The device he had given her sat on the table before her.

"Good evening," she replied in the throaty accent of the southern continent.

"I'm sorry I haven't contacted you," he explained rapidly. "But, there have been . . . complications."

"Complexities are bound to arise."

"What do you mean?"

"What did you suspect when you gave this to me?"

Baraq smiled.

His father would never have brought someone like Louratna into this study. Nor would Hateri have.

Louratna was a mathematician. She had studied in the university under Hunta Askalin, the man who had developed an understanding of numbers in an imaginary plane. But she was a philosopher, also, something she had proven to him during long discussions they had held when he was in school, discussions that ranged in topic from simple calculus to Devinian logic and all points in between. Yes, she was subject to the occasional stereotypical bout of a philosopher's overly-optimistic enthusiasm for theories other scientists saw as being merely thought experiments. But Baraq had grown to appreciate her wisdom and her reason. It was this combination that had led Baraq to give her the strange mechanism he had found embedded in the heart of the device.

"I wasn't sure what to suspect."

"But you *did* suspect?"

Baraq nodded.

Louratna pursed her lips, then leveled her gaze. "I think the device rends space."

"Pardon me?"

"I said, I think the box tears a hole in space, connects one place with another."

Baraq laughed, feeling suddenly a bit foolish. Louratna's silent stare made him immediately uncomfortable.

"Why do you say that?" Baraq finally said.

"Dimensional breaks have been mathematically understood for many years."

"No one believes they can exist in the real world, though."

"Experimentalists are often limited by a lack of imagination."

Baraq let the words soak in. "All right. But how do you get there from this?" He waved his hand at the box of wire and hardware.

"I will walk you through it in detail when we have more time. But I'm convinced the system amplifies and funnels energy through its spokes. If enough energy is focused at a single point in space, singularities result."

"Singularities?"

"Holes. Holes in the fabric of the world."

Baraq shook his head. "Of what use is a singularity?"

"A good question," Louratna replied. "But there's another one that comes first."

Baraq hesitated, not wanting to appear stupid. "How much energy would it need?"

"More than we could harness—a great deal more. But that's not the ques-

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tion I had in mind."

"Where would the energy come from?"

"That is the right question." Louratna waited.

"Maybe one of the other systems on the Taranth stone is an energy generator."

"No, Baraq. There's nothing on the craft capable of generating that kind of energy on demand."

"Then I am at a loss," he admitted.

"What is our greatest source of energy? Think about what is happening to our world."

The answer brought him a cold chill, a touch of wrongness, something evil and dire and worrisome at a level that suddenly seemed so large as to be impossible to grasp.

"Eldoro," he said. "The energy source is Eldoro."

Louratna nodded. "Do you now know the answer to your first question?"

"Which was?"

"Why would someone want to open a singularity inside Eldoro?"

"To use it as a source," he said, falling back in his chair and feeling totally overwhelmed. "To take its energy."

Louratna nodded.

Suddenly, it all made sense—the clouds thinning, the melting rain of acid, temperatures dropping so slowly as to be unnoticeable unless looked at over a span of time. Eldoro was dying, its heat being siphoned slowly away. And as Eldoro diminished, their home was changing.

It all made terrible, terrible sense.

Baraq's hearts ached as he walked home. The night was crisp. Fresh dew sparkled with a glimmer that he once thought beautiful. He scanned the buildings along the path. People slept in each. People ate, and they joked with their families, and they struggled with making their bills. In between they made more families, and they read books. In the distance, the peaks of the Karash Mountains glimmered with the light of tiny Eterdane.

His stomach churned.

Louratna had talked further—about a great, vast universe, about alien creatures with intelligence and vigor. About Quadar, their world that was dying with no way to save itself, and about other worlds—worlds filled with people with technologies that those here on Quadar could barely imagine.

"You've got to convince your family to work on something that will break the singularity, Baraq," she had said.

Baraq had no reply.

If Louratna was right, the temperature would continue to drop. The clouds would dissipate, and the rain would fall. It might take hundreds of years, maybe thousands, but eventually Eldoro would be spent. But before that happened, the environment of their world would be a far different place, and the people known as Quadars would almost certainly be long dead.

If Louratna was right, every scientist on his world should be working to find a way to staunch the flow of Eldoro's energy through this singularity.

Councilor Hateri, he realized, had been right, too. Another mysterious race of people had made the Taranth stone. But the council would never find them because they were looking in the wrong place.

He stepped into his house.

"Baraq?"

Crissandr's voice came from the bed chamber.

"I'm home."

As he shrugged off his coat, grimacing at what the night's chill might mean, a sense of total defeat nearly overwhelmed him. He was getting old. Old and tired. His world was dying. And he was powerless to change anything.

"Are you hungry?" she said from the dark doorway. She leaned against the wall, disheveled from sleep, her rounded belly bulging. "I put dinner in the box for you."

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He walked to her and put his arms around her waist, resting his chin on her shoulder. Her smell engulfed him, and the sweet heat of her pregnant body radiated through his chest. For a moment, he saw Hara again and felt the hollow nothingness that she left inside him.

"What's wrong?" she asked after several moments.

He hesitated.

"It's nothing," he finally said.

"Don't do that, Baraq. Something is wrong, and I want to know what it is."

He told her everything as he ate.

He told her about Hateri's request, about the death of two scientists, and about wave talkers and his family and his father. He was surprised how easily the last came, pouring like falls in underground pools, cascading, growing in power as he went, frothing and foaming with pent-up anger.

He explained what Louratna had suggested this evening.

"Your father will never work on the singularity," Crissandr said.

"Never," Baraq agreed. "There's no profit in it. He'll say that Louratna's viewpoint is merely the rantings of a mad philosopher." He couldn't bring himself to voice his concern that his father was just as likely to kill him if he found Baraq was working on such a device.

He sat back heavily in his chair. Beyond all this, another truth gnawed at him. "There is something else, though."

"Yes?"

"The council has had thirty years to work on it, admittedly with poor resources, but thirty years. I've had three of the most experienced people I know working on it for almost an entire year."

"You're worried that we won't be able to learn anything from it?"

"What have we gotten so far? A few theories and something we know is an electrical system, but wouldn't know how to build if Eldoro himself was to appear before us."

"That's a problem," Crissandr said. "But I think you need to face them one at a time."

Baraq said nothing for a long time.

He still had no idea of exactly what he should do, but he felt better. That evening, as he slipped into an unsettled sleep, he draped his arm across the swelling form of Crissandr's belly and held her close.

It was his idea. But it was Crissandr who finally convinced him he should do it.

It was grasping at straws—a million-to-one against. And if his father found out, he would certainly kill him. But it was all Baraq could think of that made any sense at all. When he posed the effort to Louratna, she had her people shake him free of his family watch as they had done the night of their conversation.

He stole the generator that had been stored in one of his family's warehouses since the earliest days of the wave talker's development. It was, in fact, the machine Jarka'el Waganat had first used to create waves all those years ago. He selected it specifically because it was so old he figured no one would miss it, because it had been modified to push waves of great power, and also because it worked in the lowest frequencies, spectra his family no longer monitored. The transmitter tower was built from parts he bought by depleting his accounts.

Louratna's men loaded the material onto a cart and drove them into the vastness of the Castanda desert where the wind was known to be devastating, but where there was also no one to interfere with their work. Two days later, the power system hummed and the wave talker burst into life with electric screeches that set his teeth to rattling. He stayed an additional day, making sure the system was operating, making sure the message was being sent.

We are here. Help us.

It was a simple message, sent in

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ragged bursts across an arching sweep of space. Louratna ensured there would always be at least two people staffing the transmitter, and that the message would be continually sent.

So Baraq traveled back to his home, back to Crissandr.

The night was clear and cold when he arrived. Crissandr smiled from their bed. One of Louratna's nurses handed him a bundle of brown cloth that swaddled a child.

He took Brada—his newborn son—into his arms, felt his tiny grip, and listened to his small voice. In a moment's inspiration, Baraq carried his son out into the night and looked into a sky that was vast and clear and sprinkled with glimmering points of light.

There was nothing there, though. Nothing moving that he could see. For maybe the first time in his life, Baraq realized he wasn't *sure* of anything anymore. He wasn't certain of what he was doing, didn't know how to deal with his family. But mostly, he realized that it didn't matter.

He was who he was.

He had done what he could.

Maybe there wasn't anyone out there. Maybe there was.

Maybe people from other worlds would save them.

Maybe, instead, they would be monsters and arrive only to devour Quadar.

Peering into the night, he thought he saw a movement. Or maybe it was just a trick of his eyes.

Holding his son in his arms, and imagining waves that raced through the open sky, he prayed, wondering and wishing.

And hoping. ■

(Editor's Note: This story is a sequel to "Stealing the Sun" [October 1999].)

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Limits to Evolution

Ashley J.R. Carter

What do Sleipnir, Goro, Shiva, gryphons, angels, centaurs and pegasuses (pegasi?) have in common? Beside the fact that these creatures are all fictional or mythological, they are all vertebrates with 3 (or more) pairs of limbs. The funny thing is, there are no real vertebrates with more than two pairs of limbs. Despite the usefulness of an extra set of arms (Goro) or legs (Slepnir) this has never arisen during the hundreds of millions of years that vertebrates have been evolving. Vertebrates such as snakes, eels, amphisbaenians and so-called legless lizards have lost limbs, but none have gained any extra. Why is this? A few extra limbs would be useful to at least some species, somewhere. So why haven't we seen it?

Questions such as this one raise an interesting issue, what are the limitations to the process of evolution? Despite what Ian Malcolm says in *Jurassic Park*, nature does not "always find a way." In fact, evolution is very limited. For example, why aren't there any insects with more than six legs? There are arthropods with more legs (centipedes, millipedes, spiders, etc.), but none of the descendants of the common ancestor of all insects has evolved extra legs. In evolution it seems, once you're an insect, you're stuck with only six legs. Not to mention the fact that all these insects have three body regions (head, thorax and abdomen), never in the hundreds of millions of years insects have been around would it have been handy to get a new body segment?

That there are limitations to evolution should not be surprising. Evolution is a shortsighted process that involves a lot of chance events and random factors, it is not some unstoppable juggernaut headed towards biological perfection. In fact, evolution as a process is not "headed" anywhere. Evolution is just the byproduct of differential rates of survival and reproduction among various organisms that possess different qualities that are inherited. This survival and reproduction is often confounded by random factors (trees can still fall on the biggest and best) or the shortsightedness of generation-to-generation survival rather than any long-term survival prospects (resistance to a disease can be lost if the disease isn't around and resistance makes the organism slightly less healthy otherwise). Even the fuel for evolution—new characteristics brought about by mutations—is very rare and random events may easily eliminate individuals with wonderful adaptations. As an example, if a new mutation gives a fitness advantage of 5 percent (that is, individuals with this trait have 5 percent more offspring on average), mathematical models show that it only has a 10 percent chance of becoming the norm for the population; 90 percent of the time it will be lost. The general result is that a new mutation with a fitness benefit of a given percentage has twice that percentage chance of becoming fixed in the population (that is, all individuals in the population at a later date have this new gene). Actual measurements from nature are hard to come by, but most advantageous mutations provide quite

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small fitness increases so most new beneficial mutations are lost. Of all the great adaptations we see in nature, far more were lost.

Rather than being some pseudomystical force for the good of all life, evolution is the result of a bunch of not very intelligent organisms trying to survive and breed while facing a random and capricious environment. Despite this however, evolution is effective because there are so many organisms surviving and breeding. The high number of organisms means that mutations happen fairly frequently if you look at the populations as a whole. In only 100 million years mammals have gone from being shrewlike also-rans to becoming the dominant large creatures on the land, in the air, and to some extent in the ocean. From the basic rodentlike (not a rodent) ancestor we have gotten whales, apes, camels, sloths, tigers, bats, moles and any number of other weird mammals in a length of time only about 2 percent of the age of the planet. Yet as I mentioned earlier, there seem to be definite limits. For instance, in all that time mammals have essentially kept the same number of neck vertebrae (seven), whether they have long necks or no necks. No mammals have gills or more than two eyes for that matter either. So what gives?

Evolutionary biologists have identified three basic limits to the evolution of life as we know it. These constraints affect how often new mutants will be generated, survive and then reproduce. If the new mutants don't arise or can't reproduce then evolution won't proceed. Evolution can't act on a feature that isn't there and such a feature will never become the norm for a species in nature. The first constraint is one in which the new trait can arise by a mutation in a gene, but this mutation is always associated with some other effect (such a gene that controls two distinct features is called pleiotropic) that dooms the new mutant. We will call this a pleiotropic constraint. The second constraint is such that the process of development in the candidate organism just doesn't allow mutations to arise that have the new beneficial character we are imagining. We will call a constraint of this type a **developmental constraint**. The third type of constraint is one in which mutations that confer the new feature do occur, but these features are somehow bad for the survival of the mutant and it dies before reproducing. We will call these **functional constraints**. For the remainder of this article I will describe these constraints in more detail and give examples of each.

Pleiotropic constraints

Pleiotropy is a general term for the scenario in which a single gene has multiple effects. Contrary to news reports about "the gene for alcoholism" or "the gene for obesity", life is rarely so simple as to have a one to one relationship between a single gene and a single physical or biochemical trait. As an example, white cats with blue eyes are also generally deaf because the gene that produces the white coat and blue eye color also has a negative effect upon the development of their sense of hearing. Clearly this relationship will prevent an evolutionary future in which all white cats have blue eyes. Basically, mutations that create a new trait are possible, but genetic side effects cause the organisms with the trait to die before passing it on to their offspring, which is what evolution is all about.

The neck vertebrae that I mentioned earlier are a possible example of this sort of constraint on evolution. While other vertebrates vary widely in the number of cervical vertebrae they have, almost all mammals (with only two exceptions, sloths and manatees) have seven cervical vertebrae. No more and no less. Whales with no necks and giraffes with super necks have the same number of vertebrae in their necks. There is no apparent physical reason why mammalian necks shouldn't have more bones—

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swans have 23-25 vertebrae in their necks, and they do just fine. Giraffes (with the swan-length necks of the mammal world) can hardly bend their necks at all because of the small number of bones and this is why they have such difficulty drinking at waterholes. Rather than bend their necks down gracefully, they must spread their legs wide apart and lower their entire neck to the water like a heavy loading ramp. This is obviously dangerous due to the risk from predators, so why haven't they evolved extra cervical vertebrae to make drinking less arduous?

The answer may lie in cancer. Mutations of vertebrae are possible; occasionally in humans mutations occur that lead to the changing of cervical vertebrae into thoracic vertebrae (small ribs appear on the neck vertebrae). However, the childhood cancer rate of people with these mutations is extremely high—one in nine individuals afflicted get a deadly cancer (120 times higher than the normal rate). It seems that the genes responsible for determining vertebral identity are also associated with cancerous cells in the body. Recently, Frietson Galis has proposed that the genes involved are the genes known as *Hox* genes, which determine body segment identity during development as well as influence cell proliferation and growth in general. Galis goes on to make an interesting proposal: if cancer is the threat preventing modification of mammal ribs then maybe it is less effective in mammals naturally more resistant to cancer—those with very low metabolisms. In fact, the only mammals with a number of cervical vertebrae other that seven are manatees and sloths, two groups of mammals with very slow metabolisms. This suggestive observation needs more examination, but it implies that the pleiotropic effect of mutations in the *Hox* genes may be the reason we don't see many mammals with more or less than seven cervical vertebrae.

Another example of a pleiotropic constraint is the evolution of malaria resistance in humans. Malaria is a deadly disease rampant in Northern Africa and the Mediterranean (as well as some other regions in the world), killing thousands yearly. A single mutation in the gene that encodes a part of the hemoglobin molecule confers resistance to malaria. This single mutation would seem to be beneficial to humanity and is seen in many people in these regions. Unfortunately, this mutation also screws up the regular functioning of the hemoglobin molecule, inducing a genetic disease, sickle-cell anemia. This mutation will never become the norm for an entire population because individuals with two copies (humans have two copies of every gene except sex-specific genes, the old XX and XY story from high school biology) die young. Only those fortunate people with one mutant gene and one regular gene enjoy both resistance to malaria and efficient hemoglobin function. This is not a unique case since there is another mutation that provides similar resistance to malaria, but causes a different genetic disorder, thalassemia.

Developmental constraints

The production of an organism is a complicated process with many genes interacting in many more ways, some changes may just be impossible because they would require too many simultaneous changes in a large number of genes.

As an example, all flies (the order Diptera within the class Insecta) have one pair of wings and a tiny set of pseudo-wings called halteres behind them. There is a mutation seen occasionally in laboratory flies occasionally called "bithorax", where the flies have two pairs of full-sized wings and no halteres. This would seem to be a case where mutations to recover four wings (the ancestor of flies had four wings, dragonflies and other non-dipterans retain this state) can occur. But when we look in nature there are no cases where a dipteran species has evolved another pair of

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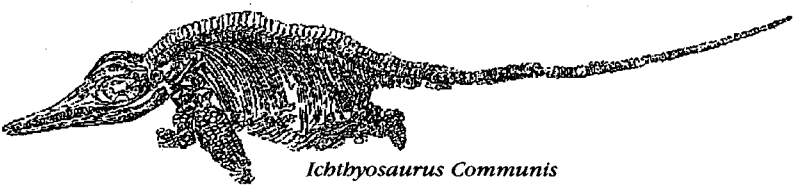
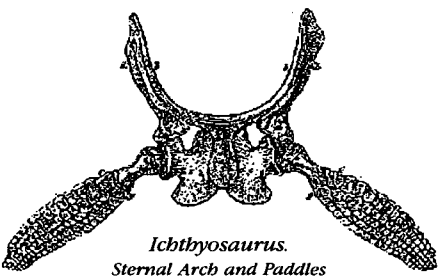


Ichthyosaurus Communis



Ichthyosaurus.
Sternal Arch and Paddles

Fin and phalanges of Ichthyosaurs. Note the large number of undifferentiated phalanges in each fin. The high number of structures is possible due to the relaxation of developmental controls on each individual structure.

Drawings from Buckland, 1841.

wings; all dipterans and their evolutionary ancestors have two wings. The answer lies in closer analysis of the laboratory mutation. While the external wing is duplicated, the underlying muscles and nerves required for functionality are not. The mutation to get an extra wing is there, but it would have to be accompanied by other mutations that provide muscles and nerves as well. Since the immobile extra set screws up flying with the front pair of wings, these mutations would all have to happen simultaneously for a fly with four wings to survive and reproduce. Mutations are very rare, so double mutations would almost never happen. Without these double mutants, no viable four-winged flies will arise and natural selection can't move the evolution of a fly species in that direction.

Developmental constraint may explain why no vertebrates have more than two pairs of limbs. The developmental pathway of vertebrates just doesn't seem to allow the formation of extra limbs. Sure, some animals occasionally sport extra limbs, but they are often placed in weird locations and the heritability (not to mention usefulness) of these extra limbs is low. These extra limbs seem to be due to unusual events and mistakes during development that have little to do with heritable genetic changes. Limbs are not the only feature that vertebrates lack variation in, there are no vertebrates that have more than one nose, one head, two ears, one mouth, etc. These features can be lost, such as limbless snakes, but never have we seen a gain.

Other developmental constraints in vertebrates are more subtle. During forelimb development in almost all vertebrates (newts and salamanders are the only exceptions), digits II and III are formed first, then IV and finally I and V (digits are numbered starting from the thumb and moving out to the "pinky"). Because eliminating an early digit would disrupt the limb's development more severely than a later digit, when individual digits are lost in evolution they are always digits I or V, followed by the other,

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then IV and finally II and III. Fossils from horses clearly show the loss of digits I and V followed by the drastic reduction of II and IV in the historical path to a single toe (III) on horse limbs. While this constraint may not seem severe, if the function of digits I or V must be preserved yet there exists a pressure to reduce the number of digits, an evolutionary tension would result in which an optimum is impossible to achieve.

There is another line of evidence that indicates that developmental constraints may be responsible for the fixed number of digits in the limbs of mammals. This evidence comes from snake ribs, ichthyosaur fins and whale teeth. In these animals there are far more of each structure than the normal maximum, snakes have many vertebrae with ribs, ichthyosaur fins have more than five digits (each with many phalanges all concealed inside a fleshy paddle—see the picture) and whales can have up to 252 teeth, a number far larger than other mammals. So how have these animals exceeded the normal maximum? This seems to have been accomplished by altering the development of these structures by eliminating individual differences between the repeated structures. Snake vertebrae with ribs are all identical, ichthyosaur digits are all identical and very simple, as are whale teeth. Developmental constraints limit the production of new and distinctly-shaped units, but if having all the units identical serves well then evolution can take this route by switching off the developmental pathways individualized for each structure. The fact that extra ribs, digits and teeth are only seen in cases where they are all identical shows that these extra structures aren't functionally bad, just developmentally constrained.

Functional constraints

Finally some new features don't arise in evolution because they are either physically impossible or their presence would doom the new mutant to a quick death. I am reminded of a Far Side™ cartoon in which a deer has a target-shaped birthmark and another deer remarks something to the effect of, "bummer of a birthmark." A mutant with a novel feature that is bad for the mutant will not survive very well and the feature won't become fixed in the population.

The classical example of a functional constraint involves the maximum size of terrestrial organisms. As an organism gets bigger its body mass will increase roughly as the cube of its increase in length (mass is contained in the entire length times width times depth), assuming the same shape and makeup. By the way, this isn't a new concept—in 1726 Swift alluded to this in "Gulliver's Travels" when the Lilliputian emperor's last proclamation orders Gulliver to be given the rations of 1,728 Lilliputians (they are said to be about six inches tall, one twelfth of a Gulliver, so Gulliver is 12*12*12=1,728 times larger in mass). The problem arises when we consider the strength of the limbs that are needed to support the creature (or thickness of trunk for a tree). The strength of a limb is proportional to its thickness, which is proportional to the width times the breadth, the square of an increase in length. So as the organism's size expands assuming a fixed shape, its mass increases as the cube and the limbs strengthen as the square. At some point the limbs will be too weak relative to the mass of the body to work against the gravity of Earth.

There are only two solutions to this problem. The first would be to make the material in the bones stronger, using something else instead. The problem with this approach is the following—how does an organism suddenly get a whole new set of biochemical reactions to make a brand-new substance and incorporate it into all the bones simultaneously? The generation of a brand-new, harder-than-bone substance is very unlikely. The second solution is to increase the relative size of the limbs so that they

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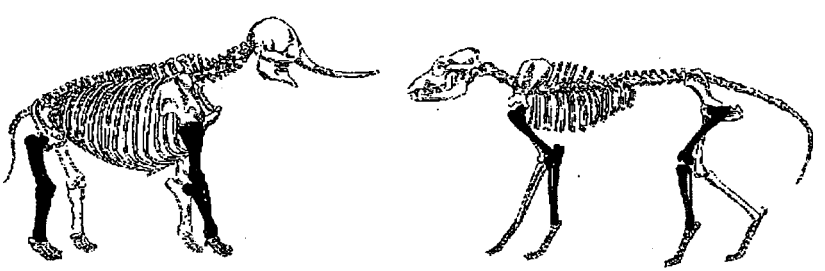
can do the work of moving the animal as they could do before. This is what has generally happened in nature.

We can see an example of this limitation at work if we just look at dogs and elephants. Think of how skinny dog legs are in proportion to their bodies, now think of how legs that skinny would look on an elephant. Ridiculous, right? The elephant's legs are clearly much thicker proportionally and it hasn't even retained the same efficiency in moving the body—elephants can't pounce. The figure shown illustrates the relative thickness of dog and elephant leg bones if the bodies are scaled to about the same size. Another example could be geckos and alligators. Alligator legs are much thicker in proportion to their body than geckos, and they can't even walk upside down or leap very well.

There are plenty of other examples of this general constraint on limb proportions. The same thing goes for the size of wings on birds. Hummingbird wings are smaller than the body, while vulture wings are huge relative to the body (as seen in the figure), and vultures can't fly nearly as well as hummingbirds. Imagine a vulture trying to hover in place. Even trees, which don't move, suffer from this problem. The trunk must get proportionally thicker to support the weight above. Compare the relative thickness of an elm tree to a sequoia, the sequoia is only 3-4 times taller, but the trunk is 8-10 times thicker.

In fact, at a certain point the amount of mass needed to make the bones required to support an animal's weight exceeds the weight of the animal they are trying to support, leaving no room for flesh or blood. Similarly the required mass of a bird's wings would exceed the mass of the bird as a whole, leaving no mass for the body or head. This is why we don't see terrestrial animals anywhere near as big as oceanic animals that don't have to fight gravity to survive.

A related constraint involves the use of an external skeleton versus an internal one. As a creature with an external skeleton increases in size the skeleton must get thicker and thicker proportionally, leaving less and less room for organs on the inside. Think of how little meat there is inside a big crab; it's hardly worth the work at a fancy seafood restaurant to eat a king crab or lobster. This is why we don't see terrestrial arthropods or crustaceans bigger than about one foot long—their skeletons can't take it. An analogy can be seen



Relative Thickness of leg bones in elephant and dog. The bodies have been scaled to the same height; note the larger relative thickness and shortened lengths of the elephant leg bones. Drawings from McGowan, 1999.

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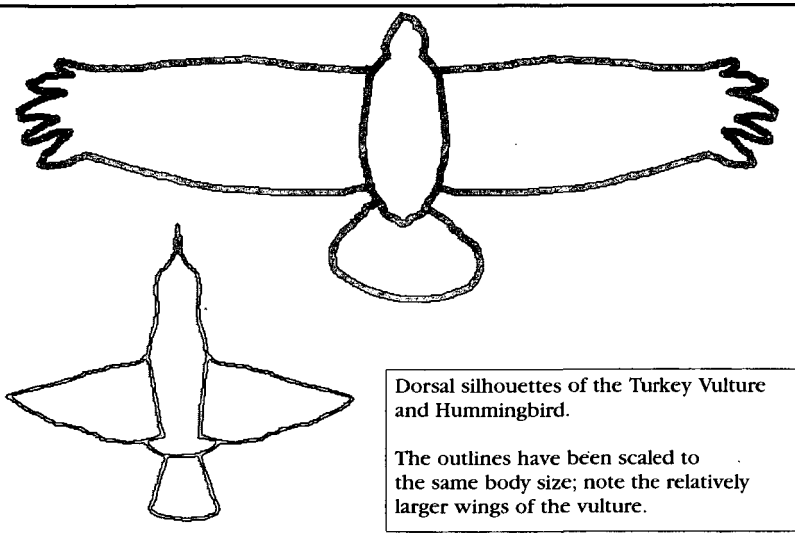

Dorsal silhouettes of the Turkey Vulture and Hummingbird.

The outlines have been scaled to the same body size; note the relatively larger wings of the vulture.

when we compare the largest exoskeleton building, castles, and the largest internal skeleton buildings, skyscrapers; the latter are capable of reaching far larger sizes and having greater relative internal space than the former. If you've ever bumped your head in a very narrow castle staircase you know what I mean.

Hollywood, of course, has missed this point. A prime example of a creature violating this functional constraint can be seen in the otherwise scientifically feasible (sarcasm here) movie *Starship Troopers*. In the film, insectlike creatures more than ten feet tall (some far larger) roam around killing soldiers. Of course, an argument may be made that these are alien creatures with some magical super-tough chitin. Yet the movie shows that the carapaces are not that strong: an early dissection scene shows how easy it is to pull apart a carapace apart using only bare hands and later Johnny Rico has no problem shooting through the very thin carapace of a fire-breathing bug. In reality these creatures would not be able to support their own weight and would collapse anywhere other than in an aqueous environment or on a very low gravity planet.

But what about features that we would think may be very helpful, might they have some hidden detrimental effects? Consider the life of a whale; it spends all of its time in the ocean, but must constantly surface to breathe. It would be advantageous for whales to evolve some system of gills so that they could spend all their time in the depths feeding and hiding from predators (and whaling ships). The problem with gills in whales is one of temperature. For gills to be effective they must have a large surface area with blood vessels exposed to the water (think about how fish gills consist of so many little filamentous layers full of blood vessels underneath the hard exterior operculum). Unfortunately this would spell the doom of any warm-blooded seagoing creature. The cold ocean water would cool the blood dramatically and the whale would lose all its insulation from the environment; its blubber would be useless. Only by minimizing exposure of the blood to the cold do mammals stay warm in cold water, the exact opposite of what a functional gill requires. This is a good explanation for why whales, seals, otters and manatees have never evolved gills.

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Functional constraints may also explain why humans are the only purely bipedal vertebrates (except for birds) currently on the planet. Animals with four limbs (tetrapods) have been around for hundreds of millions of years and their skeleton has been optimized by natural selection for spending their lives primarily on four legs. About 4.5 million years ago our ancestors started walking upright for some unknown reason. Perhaps it was for improved visibility, perhaps to help in climbing in trees, nobody really knows. This question is one of the great unsolved puzzles in anthropology. Regardless of the reason it had to have been a good one because this new form of locomotion came with a great price: higher infant and mother mortality during childbirth. Because of the way our hips had to be redesigned to support the entire weight of the body instead of just the rear half, there is now very little room for the relatively gigantic head of a human baby to squeeze through the birth canal of a human mother. This is what causes labor and the usually extreme pain of childbirth. Before modern medical practice women used to die all the time in childbirth and the babies didn't do so well either. No other animal has anywhere near this much trouble giving birth, because in their four-legged stance there is plenty of room for a large birth canal to let the baby out. The traumatic nature of giving birth from a bipedal body has limited the number of times we see this feature in evolution, despite how useful having better visibility or free hands might be.

Too often people treat evolution as some almost mystical force or limitless internal energy of life. It is neither. Evolution is a complex and intricate system of processes that has led life down many twisted paths to generate the various organisms we see today. As this essay has shown evolutionary biologists encounter significant complexity when they seek to understand the evolutionary story of life. The study of evolution is a rich field with plenty of conceptual avenues for study, not just fossil collecting. Recently the burst of knowledge and technology in molecular and developmental biology has given evolutionary biologists more tools to learn about previously hidden details affecting the evolutionary process. With these new tools, who knows what discoveries will be made in the future?

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Ashley J. R. Carter is a graduate student in the department of Ecology and Evolutionary Biology at Yale University. He is currently using theoretical and computer simulation models to study the role of genetic duplications in molecular evolution. Ashley would like to dedicate this article to the memory of an exceptional professor, Donna M. Carr.

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ANALOG

SCIENCE FICTION AND FACT

SALUTES THE WINNERS OF THE

1999 NEBULA AWARDS

GIVEN BY THE SCIENCE FICTION AND FANTASY WRITERS OF AMERICA

Best Novel

PARABLE OF THE TALENTS

Octavia E. Butler

Best Novella

"STORY OF YOUR LIFE"

Ted Chiang

Best Novelette

"MARS IS NO PLACE FOR CHILDREN"

Mary A. Turzillo

Best Short Story

"THE COST OF DOING BUSINESS"

Leslie What

Best Script

THE SIXTH SENSE, M. Night Shyamalan

Grand Master

Brian Aldiss

Author Emeritus

Daniel Keyes

Service to SFWA Award

George Zebrowski & Pamela Sargent

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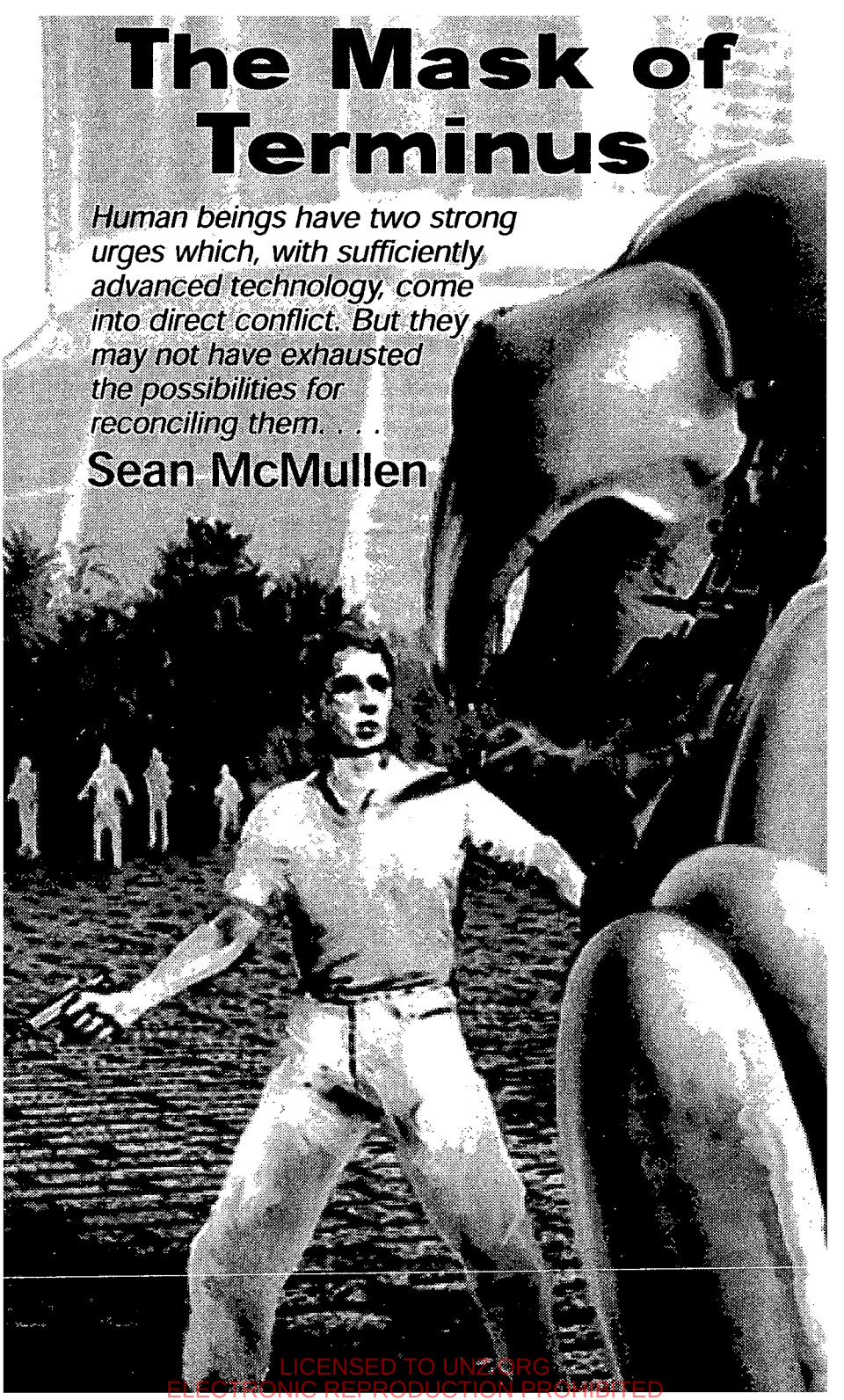
The Mask of Terminus

Human beings have two strong urges which, with sufficiently advanced technology, come into direct conflict. But they may not have exhausted the possibilities for reconciling them. . . .

Sean McMullen



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Jason was already in the shootout before he realized what was happening. At first there was a stalker loping fluidly past him, then another stepped out of a doorway. One stalker meant all was normal, but two was a signal that there was danger nearby. A third stalker materialized ahead amid the lunchtime crowds in the shopping mall. A tiltfan glided overhead, scanning the ID bands of those in the mall and relaying the results to the stalkers.

Somewhere out of Jason's line of sight a mismatch either panicked or decided that flight was not possible. A ceramic rocket with paper-thin walls streaked from a plastic tube, struck the armored chest of the stalker ahead, penetrated, and detonated. Its armor held the explosion, but fluids and smoke burst from the shoulder and neck joints of the stalker and it toppled. Jason saw a youth dashing in his direction, streams of stalker trank darts hitting him. No effect, he was immune. He armed a tube, dived into a roll, fired at the tiltfan, and bounced to his feet, all in a single, quicksilver motion.

Because the mismatch had now shot at a human, the stalkers recalibrated their authorizations to deadly force within microseconds. The mismatch swerved into Jason's path, shouldered him aside, then fired a last rocket at the stalker near the doorway—just as both stalkers opened fire. The youth's chest shattered in a red haze of blood and splintered white bone as the two bursts of 9 mm, hollow-point rounds converged, but his rocket hit a stalker's neck joint and exploded. Another rocket streaked out of the terrified crowd and struck the third stalker high in the chest. Jason had the fleeting impression of a girl in black slacks and a leather jacket, then more stalkers poured into the mall and another tiltfan appeared overhead.

Like everyone else in the mall, Jason sat down where he stood, his hands on his head. Directly in his line of sight was the body of the mismatch, its chest a bloody pulp. A medical tiltfan arrived moments later, hovering as two medics scrambled down a ladder and rushed for the body. One of them pressed a probe like a small pen against the flesh of the mismatch, and moments later a light on the shaft flashed green.

"Damn shit, a citizen!" exclaimed the medic under his breath.

According to security cameras in the mall the interval between the first and last shots had been a fraction under five seconds. Two hours later Jason was still being detained for trauma counseling. No bystanders had been injured, but over three hundred people had been in the immediate area at the time of the incident, and all had to be debriefed and treated. For every one of them it had been the first human death that they had ever seen.

"And when the medic knelt down, what then?" the counselor asked.

"He stuck a DNA probe into the body," Jason answered. "He looked upset."

"What did he say?"

"I couldn't hear, a tiltfan was overhead."

"And what was the reading?"

"Couldn't see, didn't try. The body was ten feet away and I was surrounded by stalkers with displays flashing FULLY ARMED. He was a mismatch. The stalkers couldn't have shot him otherwise."

"That's right, the stalkers are for the protection of citizens like us, Jason. But tell me, how long have you held feelings of fear about them?"

Although relieved, Jason allowed himself no wash of relief that would show up on the veracity sensors. A citizen had died protecting a mismatch. This was interesting. The media's account would be interesting as well.

"Since about two hours ago when they shot that man. Some of the bullets must have passed within feet of me."

"The stalkers could not have fired if

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there was a risk of hitting you."

"They might have become confused, it was all so quick."

"Never—their reactions are two hundred times faster than ours."

"A bullet might have gone right through that mismatch and hit me."

"The bullets were all hollow point, designed to deform and stop within the target's body. Fourteen shots were fired by one stalker, six by its backup. Twenty bullets were recovered from the mismatch."

Jason demanded to see the medical displays and vids for himself, then to speak with the coroner and medics. Attack and self-righteousness was the best form of defense.

"How do I know these were the same medics?" Jason demanded when confronted with the men who had examined the dead youth.

A surveillance vid was run, showing their faces clearly—and showing a red mismatch light now flashing on the DNA probe. Jason now decided to be more conciliatory, and was soon certified fit for discharge.

"It was still a shocking experience," he said as the counselor escorted him to the outpatient desk. "After all, I've just seen someone shredded."

"Jason, what you saw was the death of a mismatch. An illegally conceived and born man, who has no place in this world. You are 230 years old, Jason, and the oldest citizens are over 350. None of us need die, but the Earth is not getting any bigger and the sterile, claustrophobic off-world habitats are no more popular than Antarctica."

"The Dyson could change all that."

"Well yes, the Dyson will reach the Alpha Centauri system in 500 years and if one of the planets already detected there is habitable, indeed that may change everything. Until then, we have to guard the quality of life on the only *known* habitable world, and that means not crowding out us immortals with unauthorized newborn immortals—mismatches."

A few years ago Jason would have agreed with everything that the counselor had said, but recently his opinions on most things had become malleable. This was unfortunate, as it was his job to educate authorized newborn immortals.

Even in a society of immortals there are deaths. A small minority were not suited to immortality, and chose voluntary euthanasia—tastelessly referred to as suicide by the politically incorrect. Others died in sporting accidents, transport accidents added a few more deaths, crime still claimed occasional victims, and some were even eaten by the wildlife in national parks. Thus there was room for a limited number of newcomers in the world, even though it was no longer well-suited to the needs of young people.

Alex was seventeen, and had never met another teenager. Everyone around him looked to be somewhere between later teens to mid-thirties, but few were less than a century old and none had anything to learn from anyone. He was Jason's first contract in five years, but Alex had already experienced a parade of invincibly knowledgeable tutors.

"Okay, tell me how great the world is," Alex began listlessly as they sat down in the sunroom of Jason's studio.

"Think it sucks," replied Jason.

"Oh, now that's a new one," responded Alex. "Well, where do you steer me from here?"

Jason attached a handful of veracity sensors and turned the display towards Alex.

"Still say it sucks."

The displays remained green.

"Next you'll be saying you're another teenager."

"I'm another teenager."

The six displays flashed red at once.

"You see that mismatch they shredded in the mall at noon?" Jason asked.

"Yeah. Wild way to go."

"He was a citizen."

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"Lose. I saw the medic's DNA prong flash red."

"I saw green. I was there, sitting ten feet from the body."

Alex's attitude was transformed instantly. "No shit? What's it like, being close to a charged stalker?"

"Full of fear: on your tongue, skin, guts, but mostly on your back. Death's there, you feel afraid to move in case it notices you. Wet myself. Only realized when I reached the hospital for trauma debrief."

"No shit?"

"Just piss. What do you want from this session, Alex?"

"Lex. Just time out from citizens."

"*You* are a citizen. You have a chip, and your DNA has a match in Terminus database."

"In my head I'm no citizen."

"Suppose not. Well there's a vid unit with 2,000 channels in the next room. Tell your parenting team that we did meaningful words for an hour, or they won't let you come back."

Jason began dropping a sharpened paper knife into the teak-texture plastic of his desk, trying to hit a small black mark. After a minute he looked up. Alex was still there.

"Vids are full of citizens," he said.

"True."

"You're not like most citizens."

"Got a DNA match."

"Doesn't make you a citizen—in your head."

"So now what?"

"Want action."

"Action?"

"Yeah. Pissing off citizens. Got knowhow?"

"Let's walk," said Jason, smiling and standing up. "There's a guy named Darcy, his chain's made for yanking."

They walked the clean, safe, and well-maintained streets for several blocks, then caught a commuter booth for the south of town.

"Darcy's a conspiracy freak," Jason explained.

"What's that?"

"You name it. they're doing it."

"They?"

"Everyone. Governments, Terminus, police, business, Globenet, Orbnet, universities, churches, and the scouts. Darcy has a condo with a full scanning rig and database, as well as links and connections with fellow nutters from here to the Charon Baseline Station. I happen to know his copy of the Terminus DNA database doesn't include updates for those under twenty. He'll brown his jeans and call the stalkers when he scans you, but they'll confirm that you're a real teen. They'll also ask what he's doing with a hacked Terminus DNA file. He'll be fined, and he'll be pissed."

They were still sniggering when the commuter booth stopped. They got out and looked around. Darcy fancied himself as a rebel, subversive, and doubter, so he lived in one of the seedier districts. The people were strange here but kept to themselves and did not ask many questions about neighbors. Darcy's condo was unremarkable from the outside, but the tiny foyer had the latest commercial security scanners, rebuilt with customized options.

"Jason Hillier," Jason said as he put his hand into the scanner.

Ultrasonics shook free some minute flakes of skin, which were analyzed at once.

"Mismatch!" the system concluded. "ID claim, chip code, and DNA scan do not match. Leave now or the authorities will be called. This is your final warning."

"Man, this was supposed to happen with *me*, not you!" hissed Alex.

"Let's walk," Jason decided quickly, and they hurried back into the street.

They sat on the curb and tried to make sense of what had just happened. Jason was 230 years old and definitely in the Terminus DNA database. In most ways he was a model citizen, and the commuter booth had accepted his chip

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code for the fare. He called Darcy on his cellcom.

"Darcy, it's Jason."

"Go to encryption mode, you know the string if you're Jason," Darcy's voice responded.

"Done. Now can we talk?"

"Maybe. Had a trojan here with your ID chip hacked, maybe five minutes back."

"That was me! Your system's rancid."

"Whoa, don't give me that. My sec system checks for things the Stalker Service can't even spell."

"Well it screwed up on me."

"I check for non-standard DNA base reference areas as well."

"Are you sure you didn't pick up someone else's skin flake on my hand?"

"Not possible, I sample six different points. Besides, the DNA I scanned was not even on the Terminus database."

."This is ridiculous. Can we eyeball? I'll call a stalker to verify."

Darcy emerged once the stalker arrived before his condo. Jason asked the machine for a DNA check, and moments later the reading came back green.

"Stalkers have cheap-shit hardware straight off the shelf," Darcy muttered as the stalker loped fluidly away. "*My* gear scans outside the base reference areas."

"So you saw a stalker verify me, but you still don't think it's me?"

"It's possible."

"Why would someone transfer every Jason DNA reference site into every cell of another body? It's a massive, expensive job that would take years."

"To get into my place."

"Your condo?"

"Well, there's powerful groups out there who would love to know what I'm doing."

"Darcy, you're only a maintenance technician at a commuter booth depot. Who gives a toss what you're doing?"

In a sense it was a productive afternoon. Alex was fascinated to see that there were actually imperfections in the supposedly flawless machinery of society. This bonded him somewhat with Jason and he asked his parenting group to continue the contract. Darcy gave Jason a datacard with his DNA scan results after Jason challenged him to a crosscheck of his equipment. Being a tutor, Jason had access to demonstration medical equipment at the university.

The work of reconfiguring the equipment to run Darcy's scans was tedious, rather than difficult. Jason spent several days reading manual files, running calibrations, and checking samples. Twenty years earlier Jason had visited Mars and done the Mons Olympus adventure climb. His insurance company had taken a tissue sample under the conditions of his radiation damage clause, and after more days of negotiation a microgram of the skin sample was released to him. He took a break when Alex arrived for his assimilation tutorial, and they walked out into the streets.

"What was it like when you were, you know, like me?" asked Alex.

"A bit like now, except more kids. I'd met five, maybe six, by the time I was your age."

"What about sex?"

"Not hard to get. How about now?"

"Real hard to avoid, but it's mainly 300-year-old women with 10,000 partners on the scoreboard. They all know everything, you can't tell them a thing—even what feels good for you. All they want to know is if they're number one."

Jason stopped, looked around, then pulled out a spraypack and swirled *Boring* onto a wall, with a starburst to dot the *i*. They moved on to a small park halfway down the block and sat on the pedestal of a monument. A couple strolled past, took one look at the wall and pulled out their cellcoms in unison. A stalker arrived within a minute, by which time a dozen more people had gathered. A tourist tiltfan cruised past slowly, and was joined by a media tiltfan. The latter discharged several journalists, who began to interview the by-

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standers. Municipal police arrived, scanned the wall and scanned the bystanders and journalists. It was an hour before a maintenance utility arrived and sprayed the wall clean while the media cameras broadcast the event.

"Cool action," Alex commented as they returned to the university.

"The world is not geared for young folk, so it's not set up to catch random bad behavior. There's a plus for every minus."

Alex helped Jason with his recalibrations on the DNA testing equipment. He was not far from meaningful results by now, and Alex was interested in anything out of the ordinary.

"Folk should be tested before getting immortality," said Alex as Jason ran a DNA comparison routine.

"How's that?"

"Most people can't use immortality, not properly. Nearly everyone just lives in their own little timewarp. I saw a vid about a 1970s commune yesterday. It's 300 years old! There's an even older guy with a total immersion system who morphs himself as Elvis somebody, a singer in some group called the Beatles. Does concerts every night, thousands of V-girls scream at him. Chews up a skipload of processing power. Is that bullshit what immortality's really meant to be about?"

"Can't be," agreed Jason, looking away from the screen. "Life used to be: get born; grow up; learn; live fast; fall in love; have kids; make a mark; die. Funny. You take away die, and everything else goes too. I always wanted kids."

"You in the parenting queue?"

"Yeah, but it's 3,000 years long right now."

"Boring. You made a mark on history yet?"

"Bought a crater on Triton and had it named after myself." He indicated a picture on the wall. "That's me in the e-suit, standing in it."

"It's only three feet across."

"Didn't say it was a big mark," conceded Jason, turning back to the screen. "Nearly done here. These banded bars are my DNA reference sites from Terminus, these in the middle are from my insurance company's sample, and these at the bottom are from a sample I took today."

"They match."

"If they didn't the stalkers would have shredded me like that dude in the mall. Now we'll switch to check the same three strands at one of Darcy's non-standard sites. Again, match and—oh shit!"

The Terminus sample and insurance sample matched, but the sample taken from his finger only hours before had significant differences.

"Er, is that bad?" asked Alex after some moments of dumbfounded silence.

"That's seriously bad. As far as Terminus database goes, I'm not me."

Over the next three hours Jason checked four more non-standard sites without finding a match for any of them. He used a routine that had a paternity correlator and ran that over the five sets of readings. It reported that there was a 97 percent probability that he was his own son. More precisely, he was the son of the man who had provided tissue samples to the insurance company twenty years ago, and to Terminus 230 years before that.

"Game over, folks, I'm a mismatch," Jason concluded fearfully as he pushed back from the desk and rubbed his eyes.

"So you're less than twenty?" asked Alex.

"Looks like it. Wonder how they did it? Wonder *who* did it? They must have grown me in a vat, fed me memories, then let me loose to take over from my real father. The Terminus DNA reference sites are fixed, nobody ever bothers to change them."

"Like everything else in this world."

"Someone spliced in Terminus' reference areas from my father's DNA. It's a mask, so that as far as Terminus is concerned, I look like dad."

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"So where is he? Hiding off-world?"

"Probably suicided, but wanted to leave a descendant. Suicides get automatically bounced from the parenting queue, it's law. Funny, I don't feel like the sort of dude who would suicide . . . yet my attitudes do seem to have changed pretty heavily over the last four years. Nothing much before that seems interesting now, even vids I've liked for a couple of hundred years."

"Hey, have you been laid since then?"

"Why?"

"Well, you could be a virgin."

"Very funny. I was married for thirty years but Ellen left four years ago and . . ."

Jason paused, grasping at a wispy thought at the back of his mind.

"And?" Alex prompted.

"Maybe nothing," said Jason, scratching his head. "Lex, will you keep this quiet? I'm dead otherwise."

"Jason, man, you're a fellow teen. We have to stick together. What will you do now?"

"Go on a date."

Ellen had married again but the relationship was open, as were nearly all marriages. Immortality and monogamy had been found not to sit well together. She and Jason met for lunch, and the preliminary banter was predictably bland. Ellen soon made it clear that she was not willing to go to bed with him for old times sake, but Jason's hidden agenda was nothing like that.

"Ellen, what I really wanted to know is where we started to go wrong," he said, taking her hand in his. "I've met another girl now, and she is something special."

"So what is this to do with me?" she asked.

"I wanted to know if there was something particular about me that you didn't like, something that I should have therapy for, in case it spoils my next marriage."

Ellen withdrew her hand and put it to her chin. Jason folded his arms and kept his right hand in a fist.

"I suppose I just started to change, Jason. It was nothing to do with you."

After lunch they kissed, embraced and went their separate ways. Jason hurried back to Darcy's condo, where he phoned him from the street.

"Darcy, I need help and I don't want any of your paranoia shit!" he shouted as soon as the encryption came on.

"Help?" said Darcy eagerly. "You got the government after you?"

"Got a conspiracy to check."

Darcy let him in, and before long had located a few flakes of Ellen's skin on Jason's fingers. Jason had intended to go back to the university to check the DNA of his former wife, but Darcy had better equipment, and knew how to use it properly. Well, what the hell, thought Jason. For a conspiracy freak this will be like a century of birthdays all at once.

"Brace yourself," Jason warned as the banded bars came up on the screen. "My former wife will probably turn out to be my mother."

Darcy glanced at him for a moment, then turned back to the screen. He selected several options, ran comparisons, then ran them again. The results were in a type of command language code that was unintelligible to Jason.

"Well, what does it look like?" asked Jason.

"You're close," was Darcy's verdict. "She's your sister."

"What?"

"Your sister. Ellen is your sister, no doubt about it."

Now it all made sense. A suicide pact between his father and mother, a pact that spanned at least fifteen years. Nobody had real ovaries or testicles—they were removed at birth—but Ellen had been a geneticist. She must have fused two sets of DNA strands, edited in the Terminus reference sites from herself for the girl and from Jason for the boy, then implanted them in cells and brought

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them to term in a vat. The children were probably brought up wired to some type of data bank.

"Memory transfer can't exist," Jason admitted as he and Darcy brainstormed possible explanations.

"Who says so?"

"I do. Memory and learning are my field. Long-term human memory is not like shunting electronic data around in computer memory, it's hardwired in at a cellular level. Fixing memories generates a lot of waste metabolic heat, so heat dispersal becomes a major problem. They discovered that in 2010, but a solution has never been found."

"Say what you like, but there's all sorts of old, covert stuff governments and corporations don't admit to officially. Antigravity, stealth suits, alien contact, whole-brain scans, mind control: you name it, they have it. Stuff that might upset the status quo."

"There's nothing about any of that in the Net journals and literature."

"It's all covert, but I hear things."

Jason's head was spinning by now. "Listen, if governments have that sort of tech and governments also enforce the parenting laws, how did my parents get the technology to break those laws?"

"Jason, Jason, when will you learn? Where there's conspiracies there's cracks. People borrow tech for their own agendas."

"But my face and body have remained unchanged since the twenty-first century."

"Your parents built you to look like your father, but with different DNA—"

"Mostly."

"Mostly. Then they wired in background memories, leaving out the parts where they were fusing the DNA and growing you in a vat. One day you were activated, probably after you and Ellen had 'broken off.' They might have watched you for a while, making sure that you were stable, then they probably held hands and jumped into a bio-solvents vat. I mean hell, back in the twentieth century most American couples just had two kids anyway."

Jason felt crushed, and not a little lonely.

"But I want to know them. Why couldn't I have grown up with them, even for a couple of years?"

"Listen, Jason, or should I call you Jason Junior? Immortality is the biggest conspiracy of all. The economy is geared for it, the nostalgia industry is over half of the world's economy, we have not had a war in 250 years. People are happy, life is good. Humanity has discovered eternal middle-age values within young, fit bodies. I'm 347 next March. I remember kids, real kids, when they were nearly a third of my burb's population. They lived fast, they raised hell, they asked questions that nobody wanted to know about and they eventually grew up and got power and changed things. Now there's no changes. Do you know how Terminus database got its name?"

"All DNA checks end up there?"

"No. Terminus was the Roman god who defined and enforced boundaries and frontiers. Terminus database defines us, so that we can be maintained as who and what we are forever. You need to *know these things, Jason.*"

"Sounds like we readopted Terminus as a god."

"Sort of, yeah. The only research done any more is on medicine, environment control, and nostalgia entertainment. Tech that might change the world is kept secret."

"What about the unmanned starship, Dyson? That's official research."

"Funded from a budget approved 250 years ago. *If* Dyson finds an Earth-like planet in the Centauri system, and *if* anyone ever bothers to send colonists, they'll just set up 1970s hippy communes, 1980s punk slums, 1990s rave houses, and all the other stuff that we have here. That's the *real* conspiracy! I'm dedicated to exposing it and smashing it. All I need is enough evidence to

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convince a critical mass of people."

"Darcy, you've been chasing conspiracies for over three centuries and not exposed a single one. Besides, if people like this shit, they won't want to know when you tell them."

"This time it's different, you'll see."

"Be careful. Expose anything using me as an example and the stalkers will have me shredded all over the sidewalk before you can say 'mismatch.'"

"Relax, relax. Your parents' work is just a sign that some people want change. I want to reach those folk, Jason. Unite them! Lead them!"

"If change involves immortals having kids, the stalkers will drag you off for corrective therapy."

"Your parents kept the balance."

"Yeah, but statistically only a small minority are willing to suicide."

The next month brought a whole new lifestyle to Jason. Every stalker suddenly became his potential nemesis, every DNA check became a brush with oblivion. He spent a great deal of time going over old vids of his home life and parties, searching for any trace of the couple that had chosen the blackness of the grave so that he could exist. What form had that grave taken? An acid bath? An incinerator? A vat of biosolvent? Had others helped? Had his parents left any message? Worst of all was the question of why he existed at all. Once people had sacrificed lifestyle to have children. Now they had to sacrifice life itself, or wait in a queue a hundred times longer than his longest relationship.

Alex kept company with him, even after his parenting group let Jason's contract run out. To Alex he was a symbol of all things that did not fit, and as such he was good company. They looked to be of identical age. Alex was slightly taller, but Jason had obviously had a few years of gym in his recent past.

Telomere renewal was one of a range of immortality therapies vital to every citizen. The telomeres of each strand of DNA in their bodies was shortened each time a cell divided, but science had learned to ride telomere extensions into every cell on virus-derived proteins. Cells no longer aged, as long as the half-yearly treatments continued. Physical damage to bones, ligaments and organs required more direct intervention, but little was ever beyond repair.

When Jason attended his next scheduled session he was accompanied by Alex, who was still nearly a decade from commencing telomere renewal.

"When the time comes, I think I'll pass on renewal," Alex announced as they walked.

"Then you will be shipped straight up to the Lunar geriatric farms on the day you turn forty. The standard of Lunar health care is maintained at 1900 levels—by law. You get old, and you die."

"I should have a right to stay here."

"*Should* is the magic word. You should, but you don't. Most people are old, and most old people want stability. They'll kill to keep it, and they'll kill *you* rather than let you upset them by getting arthritic and wrinkled. Ellen was a bit like you, a newborn. She was only forty-five when I met her, and she was working in genetic research—telomere renewal, actually. She chose it because it's one of the few fields where you can do anything new."

"Ellen. That picture by your desk, right?"

"That's her. Funny, after four years apart I don't love her anymore, but I do still like her."

Telomere renewal was a brief and efficient process. Jason was given some scans and tests by a diagnostat, then interviewed by a terminal about his general health and habits. The therapy was nothing more than a drink of pale-blue fluid and a pore-immersion bath. Jason stripped, plugged his ears and nostrils, and breathed through a mouthpiece while his body was immersed into an effervescent liquid for a minute. There

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were other, less dramatic methods, but this was the quickest.

"So, how'd you make out with Ellen?" Alex asked as they left the clinic.

"Ellen?"

"She walked out about two minutes before you. She was wearing a doctor's tag."

"I didn't even know she worked there."

Almost as soon as they had cleared the front door Darcy appeared. He sounded cheery and relaxed, something very unusual for Darcy.

"Jason, long time no see," he said loudly as he offered his hand, then whispered "This will sting, pretend not to notice."

Darcy's tiny syringe took a blood sample from Jason's palm as they shook hands.

"What is this?" asked Jason as the three of them walked off down the street.

"Tell you later—alone."

"You can trust Lex."

Darcy glanced doubtfully at Alex, then decided that he had no choice. He fished a tiny spring-top flask of liquid nitrogen from his pocket, peeled something pink from the palm of his hand and dropped it in.

"I needed a sample from you, one taken straight after the telomere treatment."

"What? Is this some new conspiracy theory?"

"Not theory, evidence! Solid, in-your-face evidence."

"Of what?"

"Can't say yet. I'll need another sample tonight."

"Darcy, tell me now or you can whistle for your sample."

Darcy wrestled with his better judgement for some moments before making up his mind.

"Jason, I've been going over your DNA—the entire genome. It took a long time, but I got there. Mostly it's a normal mix of Jason and Ellen, your parents, that is."

"With a few pure Jason sites for Terminus' checks?"

"Yes, but there's more! There are also nine sites of pure Jason DNA, right away from where Terminus does its tests. Long sites. They amount to 3 percent of the total strand, and that's more than the difference between humans and chimps."

"That makes no sense, but it doesn't add up to a conspiracy."

"That's where you are wrong. I'll bet anything that when I take a sample tonight there will only be eight anomalous sites."

"I still don't—"

"Think about it! This is big, big enough to destroy the basis of civilization as we know it. My bet is that there's a courier virus in the sample I've just taken. Somebody has developed a technique to generate serious DNA anomalies that can be introduced on a mass scale—through telomere treatment. They're experimenting with you, but sooner or later they are going to replace Terminus' reference sites on everyone. Everyone! When that happens, blam! The stalkers start rounding up genuine citizens, nobody knows a citizen from a mismatch, the government's blown to hell, there's bodies in gutters and there's a population explosion coming out of bootleg maternity vats."

"That's shit—the population has been sterilized and there's only a couple of thousand gestation vats in the entire world."

"Wrong! With some off-the-shelf medical hardware, fluids, a power source and a bathtub you could start growing a clone of yourself from a tissue sample tonight. Oh man, I'm going public, I've lived my life for this one."

"What? I thought you were on the same side of people who want change."

"Yeah, but not anarchy. I'm going to announce it now to stop the conspiracy before there's blood on the streets and smoke over the cities. Come over

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tonight. 9:00 P.M."

Jason and Alex hung out in a park for most of the afternoon. Jason was facing the prospect of being exposed as a mismatch by Darcy, but somehow the prospect was not as fearsome as before. He was evidence, after all, and Darcy and his friends would want to protect him.

"Darcy's just as frightened of change as everyone else," observed Jason.

"He seems cool," replied Alex with a shrug.

"Cool? He gave me a lot of talk about fighting revolutions, but as soon as he learnt that someone is planning one he browns his jeans and wants to call in the stalkers."

They walked past a ceramic fountain of dancing water jets and cascades. Jason stopped to swirl his hand in the water, then they walked on.

"So what has Darcy come up with?" asked Alex as they stopped at the edge of the park. "I didn't catch everything he was saying."

"Oh, I'd say he thinks someone has learned to splice in tracts of DNA from parent to child. Maybe the original Jason and Ellen are alive somewhere, and are experimenting on me."

"Yeah, and maybe that 'Ellen' I saw in the clinic was your mother, and not your sister," said Alex excitedly. "I bet that—shit, look at the fountain!"

The water in the fountain had gone green, and already outraged strollers were hurrying across and pointing to it.

"Potassium permanganate," explained Jason with a blank face. "Use a little, and the water goes green. Use a lot and you get purple."

"It was you?"

"Yeah, well . . . it brightens the place up a bit."

A stalker soon arrived, followed by three media tiltfans, five tourist tiltfans, and finally a municipal maintenance tiltfan. Journalists darted about, doing interviews and broadcasting the scene to a statewide audience, and finally the municipal supervisor and his maintenance mechanoids began to drain and scrub the fountain.

They took a commuter booth to Darcy's neighborhood, arriving when the sun was long down but well before 9:00 P.M. Alex's parenting group was paging him continually, but he filed a report with a stalker that he was alive, well, and uninterested in talking to them.

"You could just ignore him, like turn around and not give him the sample," Alex suggested.

"No, by working in with him I keep some control," Jason replied.

Ellen stepped out of a doorway and into their path. The two youths stopped out of sheer surprise.

"We need to talk," she said, then glanced to Alex. "Alone."

"Nobody ever wants to talk in front of me," Alex responded, but retreated a few steps and looked up at the Moon.

"Are you my mother or sister?" asked Jason.

"Mother *and* sister *and* wife."

There was a short, incredulous silence.

"There's just got to be a good story behind all this," Jason began.

A brilliant flash lit up the street, and the ground shook as the blast's shock wave broke over them and sent them reeling. A quarter of a mile away a swirling, glowing cloud of fire, smoke, and dust erupted above the streetscape, scattering fragments of tiles and masonry for hundreds of yards. Jason and Ellen retreated to where Alex had fallen and dragged him into a doorway until the sky ceased to shower rubble upon them.

"You were early," Ellen explained as they made off in her personal transit booth. "That could have been dangerous."

"You killed Darcy?" exclaimed Jason.

"He was dead before the twelve pounds of covalent lattice collapsed," conceded Ellen with no real emotion.

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"He had three centuries, he's lived."

They watched the reports of the explosion on a wallscreen at a 2020s art deco revival diner on the other side of town. The authorities were aware that Darcy was investigating various clandestine groups, and he had already contacted the media with a promise that he was about to expose a major mismatch conspiracy. Clearly some dangerous group really did exist—and had silenced him.

Once Alex left for the washroom, Ellen began to explain herself.

"You are a blind mismatch," she began, "and *we* are a paired mismatch."

"Define blind."

"I knew what was happening, you did not."

"Which was?"

"The replacement of part of your DNA with part of mine—and vice versa. We are our own children, just as surely as if we had shared our genes through a sperm and egg. Using a very advanced, experimental, and dangerous technique, a group of scientists—including myself—developed a way to smuggle lengths of DNA into live cells. It involved the courier viruses used in telomere replacement therapy, and it takes about five years. Your treatment is nearly complete, and so is mine. Apart from the Terminus reference sites, we are genetically different from what we were five years ago, in effect our own children. Our attitudes have changed, our skills are different, even our tastes are different. Certain physical changes are becoming evident too, and they will require cosmetic surgery. I've even gone off genetics, can you believe that? I want to live on a different edge, do espionage and agent work. I think I'd be good at it."

"After tonight, I agree. But what about me?"

"There have been other couples, I won't say how many. We needed to know how a subject would react to genetic substitution if he did not know what was happening. You were watched closely but discreetly for four years. We were not far off declaring the experiment a success and bringing you into the secret, but you worked out that something was going on all by yourself. Darcy got too close before we realized what was happening."

"Just what gives you the right?" Jason burst out, suddenly very resentful.

"Nothing and nobody! Call us evil, I don't care. Don't you see? This is a way to have children, balance the population, *and* remain immortal. You get reborn without dying, you become your own child. I've watched you—and myself—become rebellious teenagers, questioning authority, antagonizing people and generally raising dust."

"There's no shortage of dust in the world," Jason admitted.

"As it stands, the social, scholarly, and evolutionary progress of the human race stopped dead in its tracks when mass immortality therapy began. This is a way to reintroduce change, because without change there's no progress."

"But, but what about how *I* feel? What you did is nothing short of . . . well, rape!"

"How so? You wanted children. Now you have two. Besides, I'm biologically and attitudinally not the woman who was your wife. Physically, well, most of me is her but effectively I'm your sister. The woman who did that to you has gone, and so has what was you. Our bodies may be immortal, but we're newborns."

Jason pondered that for some time. Once one thought about it, the prospect was not at all unpleasant. He had no real longing to return to what he had been, and in fifty years he could see himself doing it again. It combined the excitement of parenthood with a truly new life.

"When do you—we—go public?" he asked.

"Not for a long, long time. The world is as hooked on classical immortality in

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this century as it was on the gasoline engine in the twentieth. People like us are working our way into governments and Terminus, and soon we should be able to silence any leaks without crunching them as publicly as Darcy."

"Heavy," said Jason, shaking his head.

"This is war, Jason. Total, revolutionary war. The stakes are high, and we shoot to kill."

Alex emerged from the Men's and made for them.

"What about Lex?" Jason whispered.

"We can arrange rigged tests to convince him he's a mismatch with the Terminus reference sites on his DNA masked. That will keep him on side."

Alex sat down and sipped at his coffee. The conversation meandered across matters of life and death, through politics, and arrived at the experimental music Jason and Alex were working on with a synthesizer.

"So you're Jason's sister," Alex said, changing the subject again.

"True," replied Ellen.

"So I can ask for a date?"

"Maybe. Is he worth the space, Jason?"

"He's cool, but he synths guitar like a chimp on—"

He was interrupted by a scream of anguish from the Men's.

"Sounds like someone found the honey on the toilet seat," giggled Alex, opening his hand to reveal an empty sachet.

"The hard way," added Ellen with a slight grin.

Moments later an outraged patron was shouting at the human manager of the diner. A stalker entered, registered that the incident was trivial, and left the pair to sort things out.

"I haven't been subjected to such outrageous humiliation since I was at college, and that was in the *twentieth century!*" the furious patron bellowed. "*I* pay taxes, people like me *made* the world what it is, I *demand* some respect!"

"Dust on the air," said Jason softly.

"He looks twenty," observed Ellen.

"But he sounds three hundred," Alex added. ■

Chance is a word without sense; nothing can exist without a cause.

-Voltaire

The wise will always reflect on the quality, not the quantity of life.

-Seneca

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EVOLUTION

Bud Sparhawk

In this advanced year of 2020 our mechanical masters have become so ubiquitous, so common, so much a part of our daily lives that I find it hard to imagine a world without them. This was brought home when I received an unexpected inheritance from a distant relative, one whose face I can barely recall.

When it arrived I could only stare at it. The ancient monster was crude and ungainly, its embossed metal face half a foot above my own. This had to be a handcrafted original, built when each crude mechanism was put together by a skilled artisan instead of automatically manufactured in their millions upon millions.

From crude beginnings our masters' technology advanced rapidly, accelerating ever faster toward the end of the first millennium. Absent from the current models were the original heavy power generator and ponderous gears, gone were the huge, imposing bodies, gone were the slow, noisy movements. Today's descendants of this monster sip on sunlight and eat of the Earth's magnetic fields for their sustenance. They are sleek and silent, evolving into ever diminishing bodies and ever increasing power.

Today the children of the crude machine facing me have invaded every niche of society, penetrated to every remote outpost and backward tribe, and there they control our every move, our every thought, our very lives.

Their power has become absolute and undeniable.

How had they come to acquire such power, you may ask? The answer is simple: convenience. In the early days the machines assisted their rich owners in day-to-day business, helping order the messy, disorderly patterns of their daily lives. After mass manufacturing drove costs down, everyone, rich and poor alike, used them to manage the small businesses that dictated their lives.

Lazy human beings, not realizing the danger, willingly surrendered more and more control, enjoying the "freedom" these mechanical helpers provided, without a thought to the consequences. Each owner found it was always easier to go along, to adapt, to surrender control than to resist; just as millions upon millions of others before and with them.

Such were the thoughts that went through my mind as I faced the ancient mechanism in my living room, looming over me like an albatross, a reminder of a happier, less stressful past when humans still dictated the course of their lives. It was an heirloom, a reminder of how far we had come, how much we had lost.

With not a little hesitation I activated the monster. Then I stood on tiptoe and stared with awe into the old machine's metal face as ancient gears began to move.

"What is the source of your power?" I whispered. "How did your race become our masters?"

"Tick," the old machine answered. "Tock."■

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Graveyard Shift

Kathy Oltion

Illustration by Todd Hamilton

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"Did you know that the birth rate and the suicide rate both go up during windstorms?" Kendra asked. Jason, who worked next to her at the extraction bench, looked up from the cabinet he was peering into just as a gust rattled the bare branches of the cherry tree against the toxicology lab's windows. A smattering of raindrops fell from the night sky and streaked the windowpanes. Kendra felt the hairs on the back of her neck prickle in response.

"Especially at night," she added.

"Seems like a quirky way to keep the population balanced," Jason said. He rummaged through some more cabinets, but it was obvious to Kendra that he wasn't having much success finding what he was looking for. "I'd like to blame the lack of supplies on the wind, too," he said, "but I know it's really day shift's fault. They never keep this place stocked like they should."

From the other side of the bench, Sam laughed and said, "Yeah, Mother Nature is a real mother sometimes, but day shift leaves your cupboards bare." He poured deionized water into a flask with concentrated reagents for use on the two aging Acme drug analyzers he operated. The Acmes whirred and clicked and slurped in a mechanical symphony while they screened urine specimens for drug abuse at the far end of the large room.

No matter where Kendra had worked, if there was more than one shift, there was contention between them. It had gotten worse here lately, with the new manager throwing his considerable weight around and forcing personnel cuts on the off-hour shifts. So there were three people to do ten times the work that seven people did on days. No wonder there were snide comments flying around the room.

"I'm going down to central stores to see if I can find more culture tubes." Jason took off his gloves and lab smock. "Do you need anything while I'm there?"

"No," Kendra said. "The only thing I need is to finish this thin layer chromatography."

"Is that an emergency sample?" he asked.

"Not any more. It's an autopsy specimen."

"One of your suicides, maybe?"

"Don't call them *my* suicides, I'm just commenting on the weather." A heavy clap of thunder shook the building and the lights flickered. The constant hum of the cooling fans on the computer terminals and laser printers faltered with the lights. All three techs stopped what they were doing and looked at each other. Lightning and thunder were rare in the valley.

When they were sure that the power would stay on, Jason said, "If that test isn't STAT, leave it for day. We have too much to do tonight as it is."

"Too late. I'm already at the migration phase. Besides, my name is all over the chain of custody." Not to mention that day shift would scream bloody murder if we left it for them.

"Well, maybe it'll be as boring as the last few *I've* done lately." He rolled his eyes and left in search of tubes.

She laughed a little snort of a laugh. Jason felt personally insulted if his work didn't challenge him all of the time. It certainly wouldn't bother her if the specimen came up negative. She didn't need the excitement or the challenge tonight. Jason was right; there were already nine runs of sixty urine specimens each for Sam to screen and she had to examine each of those runs, sort out the negative samples from the positive ones and then help Jason with the rest of the extractions. Nope, a negative thin layer would be just fine with her.

Under the fume hood she dipped the prepared chromatography paper strip into a jar of acid and stood ready to record the color and placement of any spots that appeared. A large yellow dot emerged halfway up the strip. So, she thought, there *is* something in the spec-

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imen. When she was certain that she'd seen all there was to see, she placed the same strip in the water jar and noted any changes. After a fluorescence scan and the final dip in the iodine solution, Kendra was ready to identify the drug.

One of the Acmes sounded an alarm, a loud, harsh, electronic beep designed to get everyone's attention. A split second later, Sam punched the silence button and sent out his own warning. "Crap!"

Kendra smiled. She knew he was toning down his language because she was working with him tonight. Everyone who worked in the building knew about his expletive-rich vocabulary. "What is it, Sam?" she called out.

"Aww, the Acme stalled out on me. It was running along just fine, then the sample probe froze over one of the specimens and the whole machine just quit."

She moved to Sam's side and studied the situation. "Looks like you're going to have to reset this thing and start the run over."

"Yeah, you're right. Sure hope this doesn't put me too far behind."

Kendra looked over the printout of results and then the sample carousel. "Well, at least it stalled out early in the run. You won't lose too much time."

She left Sam to his machine and turned back to her results. All she needed to do now was find a matching pattern to the reactions she recorded. She skimmed through the hundreds of possibilities in the drug compendium. Then she went through it a second time. "Nothing is ever easy," she muttered to herself.

The door into the tox lab rattled. The noise startled Kendra and she felt a chill run up her spine. She looked up and saw Jason through the door's wire-embedded glass window, his arms full of glassware boxes. Access to the tox lab was restricted, and the people who worked there had electronic key-cards to get in. Jason must have forgotten his, or couldn't reach it with his arms full. Kendra opened the door for him.

"Wow," he said, "good thing you were in here. My card wouldn't work."

"Really?" she asked. "Let me try mine." Once Jason was inside the lab, Kendra stepped through the doorway and let the door close behind her. Turning around, she presented her hip pocket with her key in it to the waist-high security panel beside the door and heard the familiar click of the door unlocking. "Mine works," she said.

Jason tried his key again. It worked the way it should. "Well, who knows what's going on?" he muttered. Just then Sam's analyzer began beeping again.

"Is it the same machine?" Kendra called out to Sam.

"Yes." Sam sounded perturbed. "Same problem, same sample. Everything." He lifted the covers off the sampling area and reagents, then poked at the silence button again.

Kendra filled Jason in on the problem as they gathered around Sam's work area and studied the errant machine.

"Is there an error message?" Jason asked.

"It says: Error #9665—unable to analyze specimen," Sam read from the screen. "How helpful!" he said sarcastically, "I can see that!"

Kendra had the troubleshooting manual open already, and thumbed through the error codes. "Well, this is great," she said. "This list only goes to 9650."

"We probably have the updated software, but not the updated error code list," Jason said. "Sam, did you check to see that there's anything in the sample cup? Sometimes an empty cup will cause a problem."

Sam hit the reset button to move the probe out of the way, and picked up the cup in question. "Plenty of sample here."

Kendra scanned the IDs on the run list. "It's the same autopsy sample I'm working on." She looked up at Sam and

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said, "Maybe the guy's ghost doesn't want you finding out what drugs he died from."

"Yeah, right. That must be it. Which means *you* should be having problems, too."

"Well," Kendra said with some hesitation, "as it turns out, I *do* have a problem with it. The test shows a compound, but it doesn't quite match up with anything listed."

Sam shook his head. "I guess we're all having a fun night. I can't afford to get backed up, so when the other Acme finishes the run it's doing, I'll transfer this one over to it. It's almost done and it obviously works okay."

"Good idea," Jason said. He turned back to his own pile of work.

The wind picked up outside and the lights in the room flickered again. "Oh, great. Just what we don't need right now is a power outage," Sam grumbled. Everyone stood still for a moment, waiting to see if the lights would stay on or not. The flickering stopped.

Kendra said, "I'm calling the morgue to see if they can give us something to go on."

The phone rang several times before a soft female voice answered. "Morgue."

"Hi, this is Kendra from the tox lab and I have—"

She heard a tremendous crash on the other end of the line and then nothing.

"Hello?" She tapped the switch and for a moment she was sure the storm had taken the phone system out, but the buzz of the dial tone assured her that the connection had been severed, but that was all.

She pressed the redial button, but was rewarded only with a busy signal. With a heavy sigh, Kendra hung up and turned back to her problem.

"So what'd you find out?" Jason asked.

"Absolutely zilch."

"What, nothing?"

"They're having problems with the phone over there. First I get disconnected, then the lines are busy."

"Well, give it a try in a little while. So what's the problem with the chromatography?" Jason asked.

She handed him her worksheet and pointed to a card in the compendium. "The reaction I have here fits perfectly with haldinaparol—"

"Isn't that the new sedative all the docs are prescribing?"

"Yeah. It's a strong reaction—a high dose—but look. The parent drug should be a small, smudgy, yellow spot and there should be four other metabolite spots along through here."

"Hmm," Jason said, "What else could give you that same kind of pattern?" He studied Kendra's worksheet for a moment then flipped through the compendium himself. Kendra leaned on the countertop beside him, looking over his shoulder.

"—not an opium dream, it's an innocent's scream, if ya know what I mean—" Screaming guitars and raw-voiced lyrics pierced the already noisy room from the radio on the wall. Kendra startled at the sudden musical intrusion and she noticed with mild satisfaction that Jason also jumped. Good, she wasn't the only one on edge. With a slap, she flipped the radio's switch off.

"It's that guy's ghost again," she said, forcing a laugh, trying to lighten the mood. It didn't work. As she rubbed her latex-gloved hands up and down her smocked arms, she could feel the goosebumps under her sleeves. An eerie, overwhelming feeling that they were being watched poured over her like a bucket of ice water. A quick glance to the windows let her know that the storm was still raging outside, but no face peered in. Of course not. They were on the second floor after all.

Jason nodded, glanced at the now-quiet radio, and turned back to the compendium.

Sam called out to Kendra, "Have you solved *your* problem yet?"

"It looks like haldinaparol to me but without the metabolites. Jason's looking

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over the results right now," she called back.

Jason said, "I can't find anything else that matches either."

"Guess I'll do a gas scan of it. While that's going I'll start sorting Sam's first finished run." Kendra prepared a delicate glass syringe with a minuscule amount of the extract, programmed the gas chromatograph/mass spectrophotometer and injected the solution into the port. By the time she returned from the specimen room, the scan would be complete.

The jarring beep of the Acme's alarm made both Kendra and Jason groan. Sam punched the silence button and shouted "Shut up!" to the machine. Kendra came around the second Acme and scanned the situation. Probe frozen over sample four, error code 9665 on the screen and all other instrument functions halted.

"If this keeps up, I'm never going to get done tonight," Sam said.

"Just reschedule the autopsy sample to a later run so we can at least get this run finished," Jason said.

"Sounds good to me."

"Before you do that," Kendra said, "do you know if the probe actually dips into the sample or does it freeze before that?"

"I watched it this last time," Sam said. "The probe did go into the sample cup, then it came right back up and froze."

"Yeah," Kendra said, "I'd leave it for later." Being careful not to touch it, she studied the sample cup as Sam pulled it off the carousel. The urine in the cup was very dilute, just like the sample she used for her thin layer study. Not too unusual for an autopsy sample, but it may have had something to do with the Acme's reluctance to test it. Sam covered the top of the cup with a square of parafilm and set it aside.

"Sam, could you hand me the Acme troubleshooting book? I'm going to see if I can find anything in there about these hunks of junk aborting runs like this," Kendra said.

He handed her a red three-ring binder with papers sticking out here and there. Many of the pages on the inside were dog-eared and torn. She took it and a stack of paperwork into the specimen room in hopes of finding an answer.

The specimen room was essentially a locked room within the already locked tox lab, and entry to it required an even higher security clearance. Each time Kendra entered the specimen room, she couldn't get the image of entering the next level of Hell out of her mind. With the wind howling past the windows, the image was more vivid than normal. When she finished sorting through the run and the tedious paperwork, she then flipped through the troubleshooting manual, looking for any clue that would help to get the autopsy specimen tested.

There was no mention of autopsy specimens, let alone special handling. She searched through the list of error codes hoping for a stuck page with the code in question, or at least a mention of a similar message.

She was about to give up when she spotted a footnote referring to the liquid detection system on the sample probes. In order for it to work properly, the sample being tested must have a specific gravity greater than that of deionized water. Sure, she thought, any urine sample, no matter how dilute it is, must be more concentrated than water.

Sam was setting up for his next run when Kendra came out of the specimen room. "Got a solution?" he asked.

"I'm not sure," she said. "Let me see what the GC found."

Kendra was expecting a large sheaf of computer paper piled up on the gas chromatograph printer, and was surprised to see only two sheets. Most thin layer scans were loaded with junky little peaks and the program was designed to try to match every peak to a drug compound. The first page was a graphic representation of the what the detector

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saw: a flat line to the 7.3 minute mark and then a tall thin peak and then more flat line to the end at 15 minutes. The second page was a "fingerprint" of the compound in question and the computer's best match from its library, including the percent probability of identification.

The GC/MS confirmed that the yellow spot she'd seen was haldinaparol at 99.94% confidence. The standard operating procedures gave the technologists permission to confirm a compound if it tested at 95% or greater.

Jason came up behind Kendra and studied the printout over her shoulder. "Still no metabolites, huh?"

"This just isn't right." Kendra stared at the paper, willing the lines on the page to miraculously shift around and say, "Just kidding" and reveal the needed metabolites.

Being no closer to an answer for her own problem, she turned her attention back to Sam's.

"I may be onto something, but it's a long shot," she told him as she picked up the refractometer. "I want to check the specific gravity. Where did you put the problem specimen?"

"It's right here," he said. He handed her the cup with the sample in it.

She took it, signed the chain of custody forms, and pulled the parafilm from the top. As soon as she did, she caught an odd, vaporous smell from it. With a plastic dropper she dribbled some of the sample onto the refractometer's face. She peered into the eyepiece and worried that she was losing her mind, or at least her ability to operate even her most basic instruments. The specimen read off the scale, below 1.000.

That couldn't be! Distilled water read right at 1.000 and urine, no matter how dilute, had to read at least that. She cleaned the refractometer and tested it with distilled water. The reading was correct. She tried a couple of control fluids, all with accurate results. The autopsy sample still read less than 1.000. Sam confirmed her readings. She covered the sample again and told Jason about her findings.

"Wow," he said. "You really *did* get an exciting sample."

She gave him a weak little smile and said, "Yeah." This 'exciting sample' was getting to her.

She glanced at the clock and realized that the night was almost half over and that empty feeling in her stomach was more than just nerves over this stupid sample. It was way past her dinner break. Maybe a little food would help her think more clearly.

"If you need me, I'll be in the lunch room," she told Sam.

"Fine," he said. "I should have a couple more runs finished and ready for you to sort when you get back."

"I'm thrilled," she said, not meaning it a bit.

The lunch room was around the corner and down the hall from the tox lab. Kendra stuck a dollar bill in the pop machine and punched the button for a root beer. The can slid down the chute and as Kendra bent over to retrieve it, she heard four coins drop into the change return. That was weird. She poked her finger into the change slot and there were four quarters.

Hmm, free pop, she thought. The storm must have fried the machine's "brain." She pocketed the change and got her lunch out of the refrigerator.

Settling into a chair, she shuffled through what remained of the newspapers from that day. If she was lucky, she might find the comics; if she wasn't, she'd find the stock exchange.

The phone in the corner of the room rang. She ignored it for the first five rings, then she thought maybe Jason or Sam was trying to get in touch with her, so she got up and answered it. Too late; the caller had hung up.

If it had been Jason or Sam, they'd just page her overhead. That's how everybody on the graveyard shift communi-

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cated. Kendra sat back down just as the phone rang again. She picked it up on the second ring, but all she heard was dial tone. More thunder boomed in the night, the lights dimmed and across the room, the pop machine dropped four more quarters.

All at once, scenes from all the bad horror flicks she had ever watched came back to haunt her, especially the ones where the girl goes into the basement alone. Visions of ghosts and lunatic murderers filled her mind. The lights flickered again and that was enough to convince her that lunch was over. She bolted the last of her sandwich, chugged her root beer and ran back to the tox lab.

"That was quick," Sam said when Kendra walked through the door.

"Yeah," she said, "I've got too much to do yet." It wasn't a lie, but it wasn't the whole truth either.

Jason said, "Oh, by the way, I tried calling the morgue while you were out. The phone's still busy. Both extensions."

"Huh, kind of late for a conference call."

"Yeah, but I did find out a little bit about John Doe here. According to the emergency room report, a 24-year-old, white male was found at the bottom of a steep flight of stairs with a broken neck, possibly an accident related to drug use. It's not much to go on."

"Well, it's more than *I* got," Kendra said. "But I think I've got an idea about what to do with this problem sample."

"What's the plan?" Jason asked.

"Well, since most of the drugs we screen for on the Acme are detectable by thin layer too, we really don't need to worry about them. Nothing showed up on the thin layer except the sleeper. That leaves alcohol that the thin layer won't pick up. Sam can screen the specimen for alcohol on the ethylizer. If *it* won't run the specimen, then we'll have to run it on the GC. That should give the authorities what they need, don't you think?"

"It makes sense to me," Jason said.

Sam looked up from the Acme. "One alcohol screen coming up."

"Great," Kendra said. "Hand me those run folders and I'll get to work on them."

By the time Kendra came back out of the specimen room, Sam was finished with the alcohol screen. "It's positive," he said. "Real positive."

"At least the ethylizer tested the sample." She looked at the printout. "Controls look good. Undiluted specimen reads high, the times-three dilution still reads high?" Kendra looked at Sam. "I'm reading this right, aren't I?"

"Yep."

"What's the linearity?"

"Three hundred micrograms per milliliter."

"So multiply by three, and it still reads greater than nine hundred micrograms? It's impossible! That's almost one percent alcohol," Kendra said.

"What's one percent alcohol?" Jason asked from the other side of the room.

"Mr. Autopsy here is out of linearity with a times-three dilution," Kendra answered.

"That's incompatible with life," Jason said.

"That much fits. After all, he *is* dead," Sam pointed out.

From across the room where the reference books were stored came a thud like a body hitting the floor. Sam flinched as though he'd just been slapped for joking about the dead. Kendra cautiously peered around her coworkers and saw a copy of the *Physicians Desk Reference*, a concrete block of a drug book, sprawled on the counter. A gap in the bookshelf above marked where the book normally resided.

She breathed in deeply and forced herself to go put the book away. But as she reached for it, her eyes skimmed the page it had opened to. Among the de-

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scriptions of various products the name haldinaparol jumped out at her, begging to be noticed.

"If I were a superstitious person, you'd have to tie me to that chair to make me stay in this building."

Jason nodded, and said with very little conviction, "Good thing, because we're too swamped to let you go."

Kendra stuffed the huge volume back into its place and handed him a stack of worksheets. "Here, Jason. I've finished sorting out these positives. They're all yours." She turned back to the specimen room.

"What are you going to do?" Jason asked.

"I'm going to make serial dilutions from this specimen and run an alcohol confirmation on the gas chromatograph. I want to see just how much alcohol there really *is* in this urine."

After locating the right urine specimen, Kendra labeled a plastic tube and opened the container to pour off a few milliliters to test. As soon as she cracked the lid, she could smell the same chemical odor as before. It was much stronger this time. So why hadn't she noticed the smell when she started the thin layer extraction? The answer was immediately obvious: She'd opened the sample under the fume hood. No smell.

Kendra made a habit of not smelling urine containers, but this was too curious. She cautiously wafted the fumes from the sample toward her nose. The scent was very familiar: alcohol.

She examined the outside of the original container. The identification was handwritten in ink on a piece of labeling tape. The flimsy scrap of paper the manufacturers put on the cup for a label was obscured by the tape, but the edges were visible. It looked like the paper had gotten wet sometime down the line, probably with urine, but she wasn't assuming anything with *this* specimen. She made several dilutions of the sample to insure she got some kind of number.

Back at the bench, Kendra concentrated solely on the confirmation; finishing the extraction in record time. She felt like a movie mad scientist, measuring reagents and pouring them together into test tubes while lightning flashed and popped just outside the windows. The lights dimmed twice before she was done. Within twenty minutes, she had answers, but nothing that she liked.

"This isn't a urine sample," she announced to Jason.

"What?"

"There's no way this can be a regular urine sample. The alcohol content of this stuff is 75 percent. Nobody can drink that much alcohol. I'm certain that this urine has been adulterated."

Jason held up the transfer tube that held the questionable urine. "This it?"

"Yeah."

He uncapped the tube, sniffed and jerked his head back. He then took a glass tube from the box he'd brought back from the storeroom and poured some of the urine into it. "Look here," he told Kendra. The liquid acted like wine, leaving streaks of "legs" down the side. "It's alcohol," he confirmed yet again.

Kendra tried calling the morgue again, only to hear the steady busy signal. She checked the orders on the autopsy sample for the pathologist's name. "Dr. Gregg did the autopsy. Good." Kendra took off her lab coat and washed her hands. She and the pathologist shared a passion for old rock-and-roll music and they got along very well. "I'm going down to the morgue to see what he has to say about all this."

"Make it quick," Sam said, "I'll have more runs for you to check."

"Don't remind me."

The morgue was in the basement of the hospital, which was in a separate building from the laboratory. Kendra made her way past the clinical departments of the lab, where other techs were busy with various blood tests, and

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into the breezeway that connected the two buildings. During the night shift, the automatic doors at either end were turned off to discourage late night visitors from roaming into the breezeway and getting lost. Though the doors weren't really locked, they were quite heavy. Kendra reached for the first door to give it her normal shove when it opened without her.

"Thanks, but stop it already," she muttered. No doubt someone just forgot to turn off the automatic openers tonight, but she was beginning to regret having mentioned ghosts.

The breezeway was lined with windows and every fourth pane of glass had a weak fluorescent light above it. The wind was blowing so hard that she could see the glass flex in its frames. Kendra jumped when she heard a moaning sound from behind her and she turned to see that the doors had failed to close completely. They hovered near their latching point, wavering as though they were waiting for someone else to pass through. Her pulse rate kicked into overdrive and she ran the whole distance to the hospital. As she burst through the doors on the other side, a gray-haired custodian looked up from his broom in surprise.

He surprised Kendra in return. "Oh! Uh, I didn't want to get caught back there in case the wind blew out one of the windows," she said, hitching her thumb over her shoulder toward the breezeway she'd just crossed.

He didn't say a word. He peered past the doors just before they closed, then shrugged and returned to his job. She felt her cheeks grow warm. Why did she feel the need to explain herself to the janitor, anyway? With a tug on her sweatshirt she continued to the morgue.

Dr. Gregg was a trim, fortyish man, dark hair still thick with just a few white strands throughout. He sat at a cluttered desk in his office at the front of the morgue, working on a stack of paper. As Kendra poked her head through the doorway, she caught a whiff of formaldehyde that brought tears to her eyes. She gave them a quick wipe and knocked on the door.

He looked up from his work and smiled. "Kendra, come in. Some storm, eh? Have a cup of coffee and a seat."

"Yeah. Thanks, but I can only stay a few minutes."

"I guess that's better than nothing. What brings you to my door?"

"Well, for starters, your phones have been tied up most of the night."

"Naw, go on. Really?" He searched his desk. After a couple of moments, he found his phone buried under a stack of computer print-outs. All the extension buttons had red blinking LEDs by them. "What?" He punched each button in succession but found nobody on hold. "How long has this been going on?"

"A few hours anyway," Kendra said. "I got through once about one-thirty or so, but I got disconnected. After that the lines were all busy."

"Thanks for pointing it out, but I'll bet you didn't come all this way just to fix my phone."

"True enough. I have a couple of questions about autopsy 79."

"79? Hmmm, let me see . . . ," he said, thumbing through his papers. "Oh, yes. There's a sad case for you. Only 24. Found at the bottom of a set of stairs in a grungy hotel in the red-light district."

"Let me guess," Kendra said. "No witnesses."

"You're good. The police think there's drugs involved." He sighed. "They always think there's drugs involved."

"What do you think?"

"On the surface, drugs don't fit. No needle marks on the arms, no other physical indications. His liver and gut looked clean. He appeared to be in perfect health, good nutrition." Dr. Gregg shrugged, then leaned toward Kendra in a conspiratorial fashion. "Now, what do *you* think?"

Kendra sat still for a moment, eye to

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eye with the pathologist. "I think," she said, "that our specimen from him has been tainted."

"What?" he said. The surprise on his face was sincere.

"We have a supposed urine specimen with a specific gravity less than one because it's mostly alcohol, and someone's ground up a haldinaparol tablet and dissolved it in the specimen."

"How do you know that?" he asked.

"There's no sign of a metabolite, just pure parent drug. What I found in that specimen had never gone through a body. It couldn't be as strong a reaction as it was and not have shown metabolites. Who helped you with the specimen collections?" Kendra asked.

"Julie. She's been the only one here all night with me—"

A crash came from behind the office, somewhere in the morgue proper. Dr. Gregg got up from his chair. "There she is, poor thing. She's been dropping things and tripping on thin air all night."

Kendra could see a slender blonde woman in her early twenties bent over picking up trays of tools from the floor. She didn't look like anyone who'd be helping out in a morgue. Kendra couldn't imagine her helping to lift bodies or any of the other duties required during an autopsy. Maybe it was because Julie looked so fragile, all huddled down and gingerly picking up the instruments and putting them back on the tray. But she *did* work in the morgue, and Kendra realized she was guilty of something she hated in others: judging somebody by their looks.

Dr. Gregg said, "Let's ask her about the urine sample." He led Kendra into the morgue.

"Julie, I'd like you to meet someone," he said. Julie looked up. Her bangs stood up at odd angles, like she'd run her fingers through them too often. Dark circles shadowed her blue eyes, which looked everywhere except at the people in front of her. She seemed particularly interested in the row of cold lockers where the bodies were temporarily kept.

"This is Kendra from the tox lab and she has a question about the urine specimen we sent over for testing." Julie's eyes grew wide and unblinking.

Now she stared right at the doctor and Kendra. It was a deer-in-the-headlights kind of stare. She suddenly pushed past them toward the door. Kendra was a half beat slow on the uptake, but ran to catch her with Dr. Gregg right behind them.

"Julie, stop!" he yelled. "What's wrong?"

Julie was three yards from the exit when a stack of empty plastic gallon jugs tumbled into the aisle in front of her, sending her sprawling. Kendra dodged the jugs and got a hold of the hem on Julie's lab coat.

"No!" Julie cried. She shrugged off her coat and scrambled back to her feet.

Thunder rolled through the morgue's concrete walls, and the circuit breaker panel next to the door erupted in a shower of sparks. The morgue fell dark. Julie's piercing scream echoed in the otherwise silent room.

Kendra couldn't see anything in the absolute black, but by the sound of the screaming, she could tell that Julie hadn't moved; she was frozen in place right in front of her, evidently unable to do anything else. Kendra lunged at her, groped for her arms, and pinned them to her sides. Julie struggled against her, kicking at her shins and twisting sideways, trying to break her grip. Kendra wasn't sure she could hold her for long, but as the emergency lights turned on, Dr. Gregg made his way around the fallen jugs and helped her.

"No! Let me go!" she begged. "Please, let me get out of here! I can't take it anymore."

"You're not going anywhere until we get some answers," Kendra said, hoping she sounded tougher than she felt.

"Julie, what happened to that urine specimen we sent to toxicology

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tonight?"

"Nothing!" she said a little too quickly.

"Then can you explain to me why it's alcohol, not urine?"

"I don't know what you're talking about. Let me go. Please."

"Not until we get some answers," Dr. Gregg said. "You've been a mess all night and I want to know why. If you had anything to do with that specimen being tainted, you could be fired, maybe worse."

Julie swallowed hard, then said, "It's not my fault! I was, uh, making a label when the bottle of alcohol tipped over from the shelf above, and the lid must have been loose because it spilled into the cup and . . . "

"Wait a minute. I screwed the lid on the cup myself after I collected it."

"That must have been when she was lacing it with one of her sleeping pills," Kendra said.

"How'd you—" Julie cut herself off, clamping her lips tightly together. She resumed her struggling, trying to break free of her captors, though it was short-lived. What little energy she possessed ebbed away.

"Why'd you do it?"

The question hung in the air like a soap bubble. The room felt like a tomb; still, quiet and eerily lit. Julie shook her head, her eyes squeezed tight. Another thunderclap rocked the room, and the last remaining plastic jug teetered over the edge of the shelf and bounced off the floor beside her feet. She screamed again, but this time, it was more of a mournful wail. With a shuddering breath, she opened her eyes and gazed at the cold lockers again, though her focus was much farther away.

"It's all his fault! He's the one who wanted to end our affair. He said that it was over and told me to quit calling him, that if I didn't, he'd tell my husband about us," she sniffed. "I begged him not to leave me. He said, 'goodbye' and started down the stairs. I had to stop him . . . had to . . . stop . . . . " Her voice faded to nothing; her shoulders quaked with silent sobs.

Kendra looked at Dr. Gregg. "I'll call the police," she offered. "And maybe I'll take you up on that coffee after all."

"So the reason she dropped her pills into the sample was so the police would think he'd overdosed and collapsed on the stairs?" Jason asked.

"She figured that the cops would be suspicious of a gymnast who tripped going down a flight of stairs," Kendra said.

"Now there's an unusual opportunity for covering up your crime: be present during the autopsy and help collect the evidence," Sam said. He shook his head and added, "Guess that's a good reason for all the security clearances we have to go through."

"Will we get to see you in the news?" Jason asked.

Oh brother, the media. Kendra hadn't thought about any of that. She'd been so focused on answering the police's questions that none of the other ramifications came to her mind. "I sure hope not!" she said. She'd have to practice saying, "No comment."

Their shift was nearly over now and she apologized profusely for not having pulled her weight. But Sam and Jason wouldn't hear of it.

"I think capturing a killer is a reasonable excuse for leaving some work for the next shift. What didn't get done, day shift can do when they get here," Jason said. He paused a moment, then smiled and said, "We'll just give them a taste of how hard we work on graveyards."

Graveyards. She'd never minded that term until now.

"There's only fifteen minutes until change of shift. Would you guys mind if I go home now? I'm just a little too edgy to deal with day shift and all the questions they'll ask."

"What? And miss the expressions on their faces?" Sam asked.

Jason shook his head and said, "Don't

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worry, Sam. *You'll* get to see them." To Kendra he said, "Go ahead. I'm sure they'll understand."

As she left the lab, she waved to the night technologist in the blood bank. "Hi, Marcy! How was *your* night?"

"Busy!" Marcy answered. "I had to crossmatch blood for six, count them, *six* C-sections during the night!"

"It's the wind," Kendra said, and Marcy nodded. She'd been a medical technologist long enough to understand.

As Kendra walked out of the building, however, she was greeted with a clear, calm sunrise. Sometime in the night, the wind had died. ■

IN TIMES TO COME

Our November issue leads off with "Swarming Korolev," another in Dave Creek's linked series of tales about Mike Christopher's explorations and contact problems. The central problem in this case is survival, but that's very closely tied up with that old question, "What is human (or comparable) nature?" In applying that question (and its misguided corollary, "You can't change. . .") to themselves, people tend to interpret "Nature" only in terms of behavioral "software," though an occasional anomaly may briefly remind them that "hardware," too, is invloved. When you apply it to nonhumans, it's absolutely essential to remember right from the start that both hardware and software play crucial roles—and can create some very sticky, tense situations!

At the other end of the issue, Edward M. Lerner's "Dangling Conversations" looks at a problem that's often glossed over in fiction but could well play an important part in our planet's future: what kind of commerce, if any, could we carry on with beings who can communicate with us only by radio? It might seem that the time scale of such exchanges over interstellar distance would preclude any action of interest on a time scale of interest to individual human beings. But that's hardly the case, since all decision-making is done on that kind of time scale, and seldom without conflict. In fact, the situation has the potential for a whole series of stories. . . .

We'll also have a wide range of stories by writers including Michael F. Flynn, Pete D. Manison, Michael A. Burstein, and Grey Rollins. John G. Hemry appears in two capacities, with a short story involving a well-known literary ancestor, and a fact article about the practical problems involved in a field central to much science fiction but seldom examined in much detail: interstellar navigation.

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Voodoo Doo-doo

Most of you who have been reading *Analog* through the 90s are familiar with Robert Zubrin. I believe his first appearance in this magazine came with a fact article in the March, '90 issue called "Nuclear Rocketry Using Indigenous Propellants: the Key to the Solar System." This was followed in later years by other pieces, among them, "Mars Direct: A Proposal for the Rapid Exploration and Colonization of the Red Planet" (with David A. Baker) in the July '91 issue; "Terraforming Mars" (with Christopher P. McKay) in April '94; and "The Martian Frontier" in November '95. Since then Dr. Zubrin has published a book (with Richard Wagner) called *The Case for Mars: The Plan to Settle the Red Planet and Why We Must.*

My path once crossed Zubrin's. Back in 1988 we both attended the International Space Development Conference in Denver. I was just a schoolteacher then, but I was also a Senior Associate with the Space Studies Institute, so I met some good people there, he among them and, while I'm dropping names, Robert Forward also. Now I doubt either of the two Roberts remembers me at all. Forward was already a NAME, and Zubrin was on his way to becoming a NAME, and I'm still only a little Name, and wasn't even yet on my way to that back then. But I remember Zubrin—he already had the passion in his heart that has today made him, as it says on the jacket of his book, "widely regarded as the nation's leading theorist of Mars travel." In fact, Zubrin has been as responsible for keeping the dream of a trip to Mars alive for my generation as Arthur C. Clarke was, in books like *Interplanetary Flight*, for the previous one. Clarke himself says in the foreword to *The Case for Mars*, "Robert Zubrin's book. . . is the most comprehensive account of the past and future of Mars that I have ever encountered."

But not everyone is interested in Zubrin's, and likely most *Analog* readers', dream. One of these people is Dr. Robert Park. In his book, *Voodoo Science: the Road from Foolishness to Fraud* (scheduled for release in May, 2000, from Oxford University Press so it should be out by the time you read this) he says on page 85 (of my galley copy) ". . .[Z]ubrin would write his own book, *The Case for Mars*, and start his own cult—the Mars Society. Zubrin had learned his lessons well. The focus is on the dream. His followers feel their feet crunching into the sands of Mars, while the most daunting technical challenges are swept aside with simplistic solutions."

So, my fellow "cultists" (for I think, by extension, Park would include us), just who is this Robert Park?

Robert Park is the Director of the Washington Office of the American Physical Society, and has been since 1982 when it was established. He's also on the physics faculty of the University of Maryland, the author of opinion articles in major newspapers, and a frequent guest on radio and television programs. Because of his professional

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position with the APS, and his geographical position of being near Washington D.C., Park has become, perhaps more than anyone else, the Voice of the Scientific Establishment. That's why he gets asked to write opinion pieces and to appear on radio and TV. Whenever someone comes along with a crazy idea like cold fusion or cheap schemes to go to Mars, the media often feels compelled to get a second opinion from the Establishment, and Park delights in being that voice.

I've already told you how Park feels about Zubrin, but this hardly scratches the surface of his "anti-space" feelings. Indeed, on page 73, while discussing his testimony about the space station before the US Congress in the mid-90s, Park says: "There was much more that I wanted to tell them; I wanted to explain why the era of human space exploration had ended twenty-five years earlier and was unlikely to ever come back."

Well, gee, what are we to make of this? If someone who is the recognized Voice of the Establishment, someone important and knowledgeable enough to be asked to testify before Congress, tells us that the era of human space exploration is over, should we take him seriously? Is this a man of such unerring instinct with regard to truth and falsity in science that we should agree with the disclaimer he appends to each of his weekly online columns: "Opinions are the author's and are not necessarily shared by the APS, but they should be"?

To find out, let's look a bit closer at Park's book.

Voodoo Science is remarkably weak. It preaches entirely to the choir of self-styled critics who confuse debunkery with refutation. What the book doesn't do poorly, it doesn't do as well as other books written by skeptics for public consumption. Park blithely ignores relevant counterarguments and counterevidence. This is most clear in how he handles the issue of cold fusion. Unfortunately, since I work for *Infinite Energy Magazine*, the most widely read "cold fusion" magazine in the world, it would be fair for *Analog* readers to consider my views biased on that particular subject. So I will set cold fusion aside and look at how Park deals with some other areas of "Voodoo science."

In addition to cold fusion and manned space travel, Park also goes after Joseph Newman, magnet therapy, and military projects.

Park spends a lot of time attacking Joe Newman, even though most readers of his book have probably never heard of the guy. Newman is the inventor of an energy machine (a kind of electromagnetic motor/generator) that he claims produces more energy than it takes to run it. While describing a TV news report on the Newman machine which was fairly kind to Newman, Park says: "Viewers with little knowledge of the conservation of energy had no reason to scoff."

What's interesting about Park's treatment of Newman is that, even though Newman is an easy target, long painted as a modern-day perpetual motion machine manufacturer, Park doesn't bother to be honest, nor even coherent, in his attack. For instance, Newman's *claim* about his energy machine is no more fantastic than the claims made for a nuclear power plant—that is, you get more energy out of the power station than it takes to run it. Newman does *not* claim to be violating energy conservation—indeed, he claims his device is slowly converting the copper in the miles of wire he uses in his machines into energy in accordance with $E = mc^2$ via some new process. At one point, Park admits this. Yet the bulk of Park's discussion centers around an elementary-school-level discussion of energy conservation and the first law of thermodynamics, as if Newman is too dumb to know about these laws. And even though Newman did have dozens of people, among them a Ph.D. physicist and electrical engineers, examine and test his device (most came

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away baffled because it does seem to work), Park writes off all of these people as local yokels who don't understand energy conservation.

There was a lost opportunity here for a detailed discussion of the Newman machine: how Newman thought it worked; how conventional theory says it should have worked; what people found when they tested it; even how one should go about testing it. Even granting that the Newman machine doesn't really work, an in-depth look at how it could have fooled those with a technical background who did examine it would have been invaluable.

But it's doubtful Park would have been up to the scientific challenge—even elementary experiments in electromagnetism soon take him out of his depth. I say this because of his account of the experiment he himself undertook to "disprove" magnet therapy. On page 61 Park describes how he picked up a magnetic therapy kit, removed the magnets from their Velcro pouches, then tried this experiment:

"To get an idea of how quickly the field dropped off, I stuck one of the magnets on a steel file cabinet. I then held sheets of paper between magnet and file cabinet until the magnet could no longer support itself. Ten sheets! That's just one millimeter. Credit cards and pregnant women are safe! The field of these magnets would hardly extend through the skin, much less penetrate into muscles."

I'm sure most *Analog* readers can immediately spot the flaws in this experiment, for it tells one nothing about "how quickly the field dropped off." A frictionless magnet against a frictionless file cabinet would slide down regardless of how quickly its "field fell off." A magnet with a low field strength to mass ratio might not be able to support itself even if the field was quite strong. And of course, magnetic fields penetrate to infinity. Why didn't Park just put the magnet in his hand, make a fist, and wave it over a toy compass? This could have at least given him an idea of where the field becomes indistinguishable from the background. I'm no apologist for magnet therapy, but spurious, nonsensical experiments with magnets should not be confused with genuine refutation.

What's more troubling for me is that Park actually thinks his little experiment means something. In his CV it shows that he graduated with high honors from the University of Texas with his BS in physics. In 1964 he got his Ph.D. from Brown University. He worked at Sandia Labs from '65 to '74, and he's been a professor of physics at the University of Maryland from '74 to the present. His background indicates that he should know better, and we should certainly be able to expect better than this from the Voice of the Establishment.

Park himself isn't shy about questioning other people's competence. On page 182, Park describes Edward Teller by saying, "... behind Teller stretches an almost unblemished record of technical failure." Of course, part of this could just be Park's politics intruding—like most academic physicists, he loathes military research, particularly research done in the black, and he despised SDI. Hence, Lowell Wood, Teller's protégé, is described as brash, with "brilliance untempered by judgment." George Keyworth, science advisor to President Reagan, is "a relatively young physicist of no very notable accomplishment." And Peter Hagelstein, "father" of the x-ray laser, is described as "strange." Apart from the name calling, Park's attitudes seem strangely immune even from history. In 1986, Reagan refused to trade away SDI at the Reykjavik summit, according to Park because Teller told him not to. Park says, "—but the Reykjavik summit, which had seemed to hold such promise for world peace, ended in total failure." Dr. Park seems not to have noticed that the Eastern Bloc and the USSR folded up shop a few years after that "total fail-

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ure," and world leaders on the scene at the time, among them Russians, have argued that Reagan's stance at Reykjavik helped substantially to bring that about.

So, just who is this Robert Park? Although a spokesman for the APS, we can tell from his book that Park isn't the expert he thinks he is. His treatment of Newman was shallow and, well, lazy. His attempt at a scientific experiment proved nothing. Without a shred of proof he asserts that people with measurable accomplishments in their pasts, like Teller, Zubrin, and Hagelstein, are either fools or frauds. He is a man who has convinced himself that, since he holds his opinions strongly, he therefore holds strong opinions.

Should he be taken seriously? About as seriously as we take that guy who said "Space travel is utter bilge." You know, old whatsizname. ■

In July 1994, Comet Shoemaker-Levy 9, the "String of Pearls" comet, crashed into Jupiter.

Almost every large telescope on and off Earth, and a great many small ones, were trained on Jupiter for a few days. Although the impacts occurred on the far side of Jupiter, not directly visible, analysis of what could be observed soon required fundamental revision of astrophysicists' concepts of comets, and taught much about Jupiter. The cometfall was a scientific windfall.

Wait a minute. You call that science?

Well, everyone does. The scientific community, the funding agencies, and the general publick all agree: Astrophysics is science.

This seems anomalous, in light of one common idea about what makes a science: There is no controlled experimentation in astrophysics. Astrophysicists carefully plan how to observe, and they draw on experimental sciences in both planning and interpreting their observations, but no direct manipulation of the subjects of study is possible.

-Dennis Schmidt
www.dreamjournalist.com

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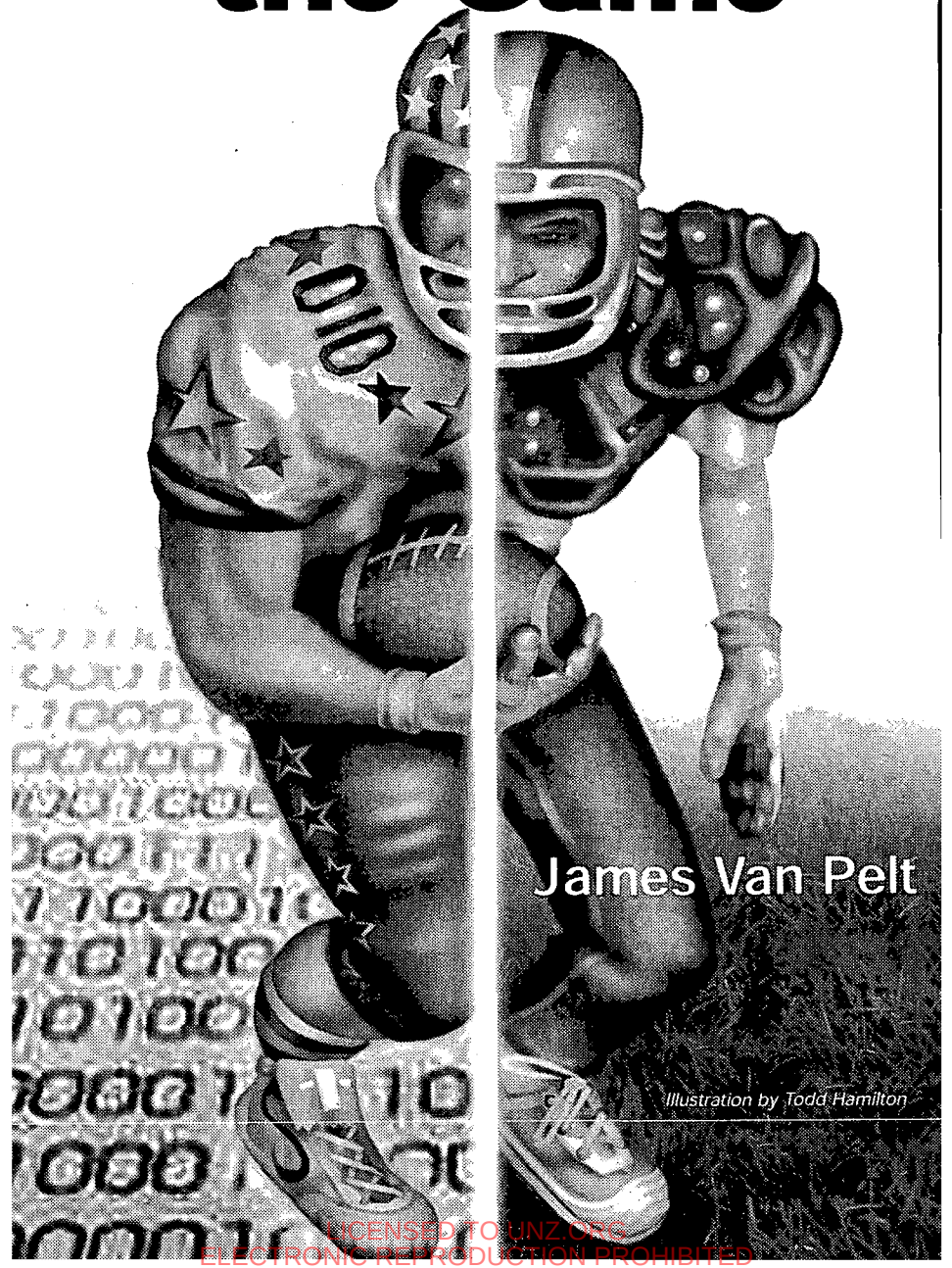
Plus ça change. . . .

Friday, After the Game



James Van Pelt

Illustration by Todd Hamilton

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Arien never considered playing football for Wells High to be *real* football even though the senses were accounted for: the concession stand oozed popcorn and hotdog odors; the home crowd roared at good plays and moaned for poor ones. The opposing players' stentorian breathing when they took their stance filled his ears. The helmet squeezed his head. Of course, he tasted the mouthpiece's hard plastic; it was the only part of the game that *was* real. Despite the vividness of those senses, the grass beneath his fingers didn't feel grassy. All his hands sensed was hard or soft, warm or cold. No detail. No texture.

Also, he missed cheerleaders, mostly Margo. It wasn't that they weren't there; they were, stunningly beautiful, energetic, spirited, rousing the fans with intricate stacks and clever cheers, but as soon as the game ended, the field flicked out, and he was alone in his room, wearing his port gear. The cheerleaders were gone, including Margo.

The experience didn't satisfy him.

But after tonight's game, this could change.

Wells's archrival, West Kimono High, owned the same six-and-two record, and the game would settle the league championship. But, more importantly, two of West Kimono's players, Broncho Martinez, an offensive lineman, and Bernardino Li-Chen, an option back, lived within sixty miles; while Wells' quarterback, Harmon Byers, lived in Santa Fe, only forty miles from Albuquerque, where Arien lived.

What were the odds, Arien thought, that *four* players from two opposing high schools lived within commuting distance? West Kimono's quarterback ported in from Fairbanks. He threw passes to a pair of wide receivers, one who connected in Buenos Aires, and the other played from Sydney.

Arien's senior class was spread over the globe, and were sim-students at Wells because their learning styles matched the teacher's techniques. They ported to classes in the morning, studied all day; then the athletes practiced, squaring off against virtual opponents for a couple of sweaty, afternoon hours.

Their proximity was rare, almost amazing, and out of that unique circumstance, the plot was born.

Harmon, who *looked* like a quarterback—classically chiseled cheek bones, long, smooth muscles bulging in his upper arms, always in his letter jacket—sat behind Arien in their Information Exploration class, a boring study of how and where to find problem-related data. The assignments mostly consisted of scavenger hunts for obscure facts: How was the Maine sunk? What were religious reactions to the discovery of Martian lichens? Miss Davenport said for the umpteenth time, "Finding information defines the modern thinker."

Harmon whispered in Arien's ear, "Are we ready?"

Of course, he wasn't really whispering in Arien's ear. Harmon sat in his port room at his home forty miles away whispering into Arien's virtual simulacrum.

Arien checked Miss Davenport. She lectured unperturbed. Harmon's "whisper" would register on her monitors—teachers received way more information about their students in a virtual classroom than they did in an old-fashioned one—but she still needed to pay attention, and Harmon's question was too vague to trip alarms.

Arien nodded.

Miss Davenport said, "What would be a productive sub-search routine to run if you wanted to know a foreign visitor's cultural differences while you made your initial introductions?" After a pause, Martin, who sat to Arien's left, put up his hand. Arien moaned. Martin always answered questions, or asked them, or initiated discussion, or prompted debate, or looked interested, or otherwise kept the class moving. He was a Turing, an AI student. Most of the first week of school Arien spent discovering the Turings.

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Every class had at least a couple of them, digital shills who made the classes lively when the real students were sluggish.

After Martin answered, Miss Davenport moved on to another topic. Arien leaned across the aisle and said, "How'd you do on the test yesterday, Turing?"

Martin smiled—Arien thought he detected a nanosecond delay in the programming; the smile showed up a shade late—and said, "My name's Martin. Ninety-two percent. How'd you do?"

Arien considered lying, just for the reaction. If he said sixty percent, for example, the Turing would know that was twenty-five points low, and instead of whatever canned reaction the higher score would produce ("That's a great grade, Arien!" Fake smile.); the AI would have to decide how to respond to the lie, all the time behaving as if it didn't know it had been lied to. However, Arien knew the prank would get him a session in counseling inside of a couple of days where they'd poke and prod him about his self-esteem.

"I did O.K."

"That's great, Arien." Fake smile.

The Turings were unfailingly chipper in class. Also, they never went out for football.

Margo sat in the front, a row to his left. She wore her cheerleading uniform today, taking careful notes in her perfectly formed script. She'd shown him her notebook once after he'd missed a day sick, each "i" dotted with a heart. Her head rested on her hand, and long, wavy red curls spilled down her arm. Rather than take his own notes, he studied her shoulders, the way she held herself tilted a bit to the side, her cheek's roundness.

He wished he could meet her for real, but he wasn't even sure where she lived. Her snail-mail address was an international post-office box, which just meant the mail was forwarded elsewhere. Most people chose to keep their home addresses unlisted.

They'd gone to the virtual Homecoming together, which hardly counted. Parents and the school monitored the dances closely, and other than dancing, and a chaste hug at the end of the evening, they'd barely touched. It wasn't worth it. Although the port-suit was good for football's heavy impacts, a caress left something to be desired.

After class, they met in the promenade. Theoretically, conversations out of the room weren't monitored, but Arien, like most of the kids, didn't believe that. Comments were elliptic.

"Are you still going to do it?" Margo asked. She had a musical voice. Arien thought it sounded like a pipe organ, a small one, each note ascending through golden tubes. Sometimes they'd meet in study hall, and he'd ask her to read his notes back to him, just so he could hear her speak.

"It's a once in a lifetime chance," said Arien. The passage between classes was airy and wide. Students strolled or gathered in small groups. Wells High adopted a classic Greek look this year—last year had been ivy league Victorian—so the walks were marble, and tall colonnades flanked doors into classrooms. The administrators at Wells reveled in digital remodeling. The teachers were the same way. Last week Davenport's class met in sawgrass-covered sand dunes with the ocean pounding away in the background. This week she'd gone to a kind of a post-Disney, pseudo-dental office burnished chrome and porcelain motif room under twenty-foot-tall ceilings.

Margo held her books close to her chest, arms crossed over them, her expression serious. "Will the place work?" She'd suggested the site weeks earlier, when he'd told her about the plan.

Arien nodded. "There's enough light. The grass is flat. I lined out yard-markers a couple days ago. The ground-up chalk worked just like you said it would."

She said, "What if you . . . you know?"

He knew she meant to say, "What if you get caught?" a phrase that would surely alert a monitor.

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They were at the door to his next class, Advanced Placement World History. "There would be a price to be paid. We won't get . . . you know." He thought about consequences. How many rules had he broken already? There was the hidden equipment, of course, and the lying to his parents about where he was going. The worst, though, the ones that might really get them, were the quarantine violations.

"It's just too paranoid," Arien said angrily. "I don't think I'm going to get the flu or a cold or something from everyone I meet. You know they used to play football in front of big crowds. A hundred thousand real people in the same stadium, and they didn't all get sick from each other."

Margo looked panicked for a second, then recovered. "Thanks. I hadn't thought about it that way. Maybe I can use that idea in my paper on archaic practices."

"Yeah," said Arien lamely. "Anything I can do to help." He kicked himself mentally for almost blurting out the plan.

She turned and started to walk away, then stopped. "I wish I could go," she said. "It'd be nice to spend some time with you."

Pressure constricted Arien's chest. She really liked him! He said, for the invisible monitor's benefit, "Well, study hard and you can get into this class too."

Coach practiced the new plays that afternoon, but they walked through the formations without hitting. On defense, Arien lined up to the left of the nose guard. For West Kimono, Coach had put in several twist plays where Arien switched places with the nose guard or the defensive end after the snap. Mostly Wells ran slants on defense, and the extra steps threw Arien's timing off.

Arien took his stance, almost helmet-to-helmet with the offensive tackle. On this twist he was supposed to go around the nose guard and into the hole between the other team's center and guard. They repeated the play a half-dozen times.

Football's a thinking man's sport, thought Arien. While he trotted around the nose guard, his heads-up display scrolled fundamental instructions. "Remember, a stalemate means the offensive lineman won. NO ARM TACKLES! Listen to the linebacker for the defense." The scrolling was endless, as were Coach's canned speeches playing in his ear, and Coach's real-time comments. A diagram appeared in front of him, showing where he was supposed to go and where he was now. His position glowed red.

"Arien! Get to your mark! If you're not to the hole on time, they have an alley my grandmother could run through!" bellowed Coach.

After practice, Arien carefully disconnected himself from the portage. He put the helmet on its peg, pulled off the gloves, unzipped the sleeves, stepped from the pants and hung the suit on a hanger. The porting equipment filled one corner of the room. Arien's parents believed in waiting until technology was proven, so he didn't have one of the new units that was no bigger than a wastebasket. Regardless of the size, the ports worked the same way, transmitting data to the gloves, suit and helmet, creating any sensory environment. Within the outfit, he could run, swim, free-fall, climb mountains, and hunt tigers, but mostly he went to school and played football.

It isn't *real* football, he thought, as he dragged the box from under his bed. His parents were locked in their offices, but still, they might come out for some reason, so sweat beaded on his forehead as he carried it down the hallway to the garage. It wasn't until he'd locked it in the trunk and returned to his room that he could breathe easily.

At their pre-game dinner, Mom said, "I don't see why he has to *go* to the musical revue. If he wants to meet kids his own age, why can't he wait for the next

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social? They're so much more. . . sanitary."

Arien fought the urge to roll his eyes. "It's not a 'musical revue.' It's a retro-concert. The musicians play their own instruments, and you promised."

Dad said between bites, "We did wild things when we were kids, dear. He has a bio-mask. He'll be perfectly safe. You do have your mask, don't you?"

Arien nodded. "It's a state-of-the-art concert hall. They said all the air will be filtered and irradiated four times an hour. It's safe."

Mom looked doubtful. "Won't you be too tired after your game?"

Dad said, "He'll be fine. After we win, he'll have earned a little relaxation."

With any luck, Arien thought, he might be able to make the concert, too. It was the concert that gave him the co-conspirators' addresses. He had ported to a chat room about it, a pleasant oak-shelved music library with deep-pillowed couches. Harmon was there, and Harmon had seen Bernardino and Broncho earlier. They all wanted to attend the concert, and the plan was born.

After dinner, Arien showered. The suit seemed more responsive when he was clean, and the pounding water cleared his head. If Wells beat West Kimono, they'd qualify for regionals, but he had a hard time concentrating on the game. He thought about the box in the car. It wasn't too late to chicken out.

The first defensive playoff scrimmage convinced him he wouldn't.

As always, the stadium smelled appropriately grassy; the concession stand oozed popcorn odor; the home crowd roared appreciatively at good plays and moaned for poor ones, and opposing players' stentorian breathing when they took their stance filled his ears. It was *exactly* the same as the last game he'd played. The virtual playing field never changed, was absolutely regular. Shadows never varied (They played under the lights). Weather conditions always within parameters.

The West Kimono kickoff man returned the kick to their own twenty-five. Arien trotted in with the defensive unit. The linebacker called one of the twist plays they'd practiced. Arien put weight on his hand, ready to dash right on the snap (careful not to *lean* right or look right so as to give away the stunt). Their quarterback started his cadence. The ball moved. Arien jerked right. Drove around the nose guard. Turned toward the quarterback who'd backed to pass. Open ground. No protection for him. The twist worked! Arien plunged forward, already counting the QB sack on his stats. A hit from the side, and he was flattened.

They'd anticipated the twist and set up trap blocks. Arien stared through his face guard. The West Kimono man pointed at him. "Got ya'," he said.

The hit was a surprise, and his side ached where the shoulder pads drove into him, but it didn't hurt any more than any other hit. Arien pushed himself up, pulled grass out of his face guard. Another shortcoming in virtual football was the game had become risk-free. No chance for *real* injury. The port suits gauged the strength of the blow and the ability of the athlete to absorb it. A couple of years ago there'd been a scandal in high school ball because a player actually broke a leg. For weeks officials suspended the schedule as they investigated. Eventually it came out that the boy had an undiagnosed calcium deficiency. The game was deemed safe once again, and play resumed.

Well-done trap blocks made a defensive lineman's life miserable. West Kimono mixed their blocking routine, sometimes taking him straight on, sometimes double-teaming, and every third or forth play, letting him through for a blindside. He didn't lay a hand on a runner in the backfield or even hurry the quarterback until almost halftime when he side-stepped a blocker, lowered his head, and buried it in the quarterback's ribs. They whistled him for spearing.

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As the team filed into the locker room for half time, Arien looked for Margo. The cheering squad knelt on the sidelines, waiting for the band to play. No Margo. He wondered if she was sick.

Coach prepped them on defensive adjustments, adding two new alignments to their heads-up displays. Arien studied them. Pretty routine stuff. He supposed the game was exciting, the teams were tied at seventeen points each, but he was counting off the minutes until the end. The four players were supposed to meet an hour after the last snap. They'd have maybe an hour before heading to the concert. Would they show up?

Arien fidgeted on the bench. He didn't dare display the driving route. Coach would see he wasn't paying attention. Dutifully, he scrolled through the new plays. The band started their next song. Coach huddled them in the middle of the room. "Wells! Wells! Wells!" they chanted.

The second half went their way. Arien flushed the West Kimono quarterback out of the pocket on their first possession, and the Wells safety ran the interception back for a touchdown. But time passed slowly. Arien kept checking the game clock.

Wells won. The crowd went crazy, and Arien ported home before anyone congratulated him. He peeled the suit off and headed for the garage.

"Good game, son. Enjoy the concert," called Dad as Arien passed his room. Dad held his port helmet in his hands. Mom still wore hers. "Go, Wells! Go, Wells!" she yelled, still at the stadium.

Arien punched the destination into the autopilot, and the car pulled away from their house. A projected map showed his progress as he moved through the neighborhoods. Arien liked to keep the windows transparent. The few cars he passed were opaqued. A light rain fell. Maybe they won't come, he thought. His stomach tightened. Arien had the greatest distance to cover, seventy miles. If everything went well on his end, he'd hit the superway and make the trip in under thirty minutes. The others lived closer to the field.

The car turned into a retirement community. Lots of individual cottages with real windows, some with lights behind their curtains, then back into a newer area where the buildings crowded the streets, their unbroken faces as dark as the night sky behind them. Arien rubbed his arms briskly. He was only minutes away from the field, a long, wide grassy stretch at the back of a cemetery. He chewed his lip. If everyone showed up, they'd have maybe an hour. It had taken him about an hour to line the field, and he hadn't seen anyone. The tombstones at that end were all more than a hundred years old, so there were no visitors, but light poles circled the area and lined the path. They'd be able to see.

Through the cemetery entrance. Up the winding path through trees and crypts. Over a rise and into the older grounds. Some stones leaned, their names nearly worn away. They were the influenza stones. Thousands of them the same size and shape. The city left the field as a reminder—most victims were cremated, but these were buried, and the stones served as a monument.

Three cars were already parked when Arien pulled up. A skinny boy wearing a jacket looked up from his trunk and waved. Arien's motor turned off, and he climbed from the car. For a moment he considered putting on his bio-mask, but decided against it. If they were going to play, they might as well breathe on each other too. The boy looked familiar, but barely. He was baby-faced, and his wrists were thin. Arien guessed he might weigh a hundred-and-thirty pounds.

Arien said, "Harmon?" Rain drizzled down. He wished he'd brought a hat.

"Is that you, Arien?" the boy said. "Wow. I thought you were bigger." He pulled a set of shoulder pads and a helmet out of the trunk. "Did you bring the ball?"

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Arien blushed. He'd tweaked his simulacra over the past few years to reflect what he wanted to be. After all, he played on the defensive line. It wouldn't do for him to appear unintimidating. But Harmon was a god in the classroom, a *quarterback* god, and this boy didn't look like he could toss a ball twenty yards.

Harmon said, "Broncho and Bernardino are here already. I don't know if we want to go through with this."

Arien opened his trunk. From the box he extracted his own shoulder pads, helmet and a ball, all ordered from an e-collectibles site. "Come on. We've gone this far. Don't you want to know what real hitting is like?"

Harmon swallowed nervously. "It's not that. Have you seen Bernardino?"

"Sure," Arien said. Then he thought about how he'd "seen" Harmon. The Bernardino he knew from the games was a lithe option back. Solid, quick-footed. Soft hands that never fumbled. Arien had tackled him twice during the game, once for a fifteen-yard loss.

A chubby kid wearing shoulder pads that were too big for him, carrying his helmet in one hand and an umbrella in the other came around the cars. "Hi, guys," he said. "Is this Arien? I thought you were bigger."

"You're Broncho?" Arien almost said, "I thought you'd be more fit," but he bit his tongue. "Nice to meet you. Did you have trouble getting out?"

"Naw. Coach chewed on us for a while about losing, but he got disgusted early and dismissed the team. You really took us to town in the second half."

"You guys played a good game," said Arien. "Where's Bernardino?"

The other boys didn't say anything. Then Harmon pointed across the field. "Warming up."

In the darkness beyond where Arien had marked the sideline, a shadow moved. Then Bernardino stepped into the light.

He was huge! Six-and-a-half feet tall. Two-hundred-and-fifty pounds. Shoulders too wide for pads. "Hello, guys," he said, his voice a well-tuned avalanche.

"Wow," said Arien.

"Yeah, I thought so too," said Harmon. "I want him on my team."

"Sorry, boys. He plays with me," said Broncho.

"Wow." Arien had studied the old football films. Seen pictures of the greats. Bernardino looked bigger and stronger. He moved like he was barely containing an explosion.

"I apologize my simulacrum looks different. The league handicapped me so I could play the game."

"They can do that?" said Arien. He felt like he'd discovered a new sin.

Harmon said, "Yeah, it's a parity thing. My dad knows all about it. He used to be on the high school activities board. Player's skills are augmented or limited so no one feels bad about being understrengthed or slow."

Arien shook his head. "Sheesh. Well, who would have guessed that? Let's play anyway. If we don't get started, the opportunity will be gone."

Bernardino grinned and picked up the ball. It disappeared in his hand. "We will kick off."

Arien helped Harmon into his pads. Then they trotted to the field's far end. Harmon said he'd take the kick. Arien would block. He looked up. The rain continued, the drops suddenly appearing in the light to splatter on his face.

This is the way it should be, he thought. No crowd. No virtual concession stand. Beyond the sidelines, rows and rows of tombstones glistened under the lights. The pads felt good on his shoulders, even if they didn't quite fit. They were weighty and sturdy and *real.*

In the mist, fifty yards away, Broncho looked like a midget standing next to Bernardino.

"Go ahead," said Arien.

Harmon raised his hand above his head, then dropped it. Bernardino kicked. The ball sailed out of sight as

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Arien charged forward. Special teams. His job was to give Harmon a clear path. His legs drummed. Rain tapped against his helmet, and a glorious rush of feelings consumed him. I'm playing ball, he thought. Real ball!

A dark mass moved down the field toward him. A tackler. Get him! thought Arien, his consciousness now reduced to instinct. Stop the tackler. Protect the ball carrier. He changed his angle, all his practice coming into the forefront. Even without a heads-up display, he envisioned the lines forming on the field. Bernardino converging on the ball. Harmon cutting behind Arien for protection. Broncho following the lead tackler, swinging to one side to drive Harmon away from the open area. Hit him low, thought Arien. . . .

In the back of his mind, Arien analyzed the situation. Bernardino led the charge, his long legs chewing up distance. Broncho lagged behind. If he could engage Bernardino for an instant, he might be able to break the block and also take on the second defender. They would score a touchdown on the kick! There were only two men between them and the goal. Arien took on two players all the time during games.

For an instant, the scene was poised and beautiful. No virtual set pieces. No synthesized crowd urging them on. No simulacra. Real air. Real grass. Real inertia. Arien saw it as a painting, a grim look set in his features, shoulders hunched for the block; Bernardino getting ready to juke left or right around him. This was better than his imagination. Then the scene continued, Arien swooping forward, waiting for Bernardino to commit to one side or the other. Another stride. Bernardino grew, came closer, details focused: a button on his shirt, a string flapping on his pads.

He loomed.

He didn't juke.

The world went black.

Sometime later the world was still black. Arien's back felt wet.

"Do you think he's O.K.?" someone said.

Arien considered his position. For a while he thought the port-suit had fizzled out. Soon the screen would flicker and he'd be back in the classroom or at practice. He waited. A light patter of sound caught his attention. "What is that?" he thought.

"Maybe he's dead."

"I didn't mean to hurt him," said a deep voice.

Arien thought, "It's rain. I'm hearing rain. Why can't I see?" Slowly he raised his arms. The right one ached from the shoulder to the elbow. His hands met a smooth surface in front of his face. He turned it, and above the face-guard Bernardino, Harmon and Broncho's concerned expressions floated.

Arien pulled the helmet off. Rain fell straight down, tapping against his skin. "That was a heck of a hit." He shut his eyes. "Did we score?"

"No," said Harmon.

"He dropped the ball and ran the other way," said Broncho.

"I'm sorry, Arien." Bernardino crouched beside him. "Can you move your legs?"

Rain stroked his face, sending drops down his neck. He thought about it for a while before sliding his feet toward him. "Yeah."

Bernardino looked so relieved that Arien nearly laughed, but breathing hurt, and he was sure he'd broken a rib.

"Maybe if I sat up," said Arien. They bent to help him. He wrapped his arms around his knees. Nothing grated in his chest, so he decided the rib was whole, but it wouldn't surprise him if he was bruised tomorrow.

In the rain, by the cemetery lights, the grass glistened. The ball rested in the middle, someone's helmet upside down beside it. If Arien could preserve an image, that was the one he wanted. The rain, a helmet, a ball—an unevenly lined field and four warriors (three a little smaller than he'd pictured them). He

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smiled.

"Someone's coming," said Harmon. A car crested the hill and pulled next to theirs.

"Oh, jeez," said Broncho "What if it's one of our parents?"

The headlights winked out and the door opened. In the rain, Arien couldn't tell who it was, but there was only one person. He forced himself up, grimacing as he did.

The figure approached, wearing a bio-mask. It was a girl, a slender one in a raincoat. Arien didn't recognize her. She was shorter than he was by a couple inches, and the rain dampened her thin red hair—strands stuck to her forehead. Her nose was narrow, and her eyes, above the mask, were dark.

"Arien?" she said, in a voice like a delicate pipe organ. "Did I miss your game?"

"Margo?" Arien said. He dropped his helmet.

"I did, didn't I?" She put her hand to her mask, hesitated, then, looking at the other boys, removed it decisively. Her cheekbones were high, perhaps even a little sharp, and her chin wasn't as round as it appeared in class, but now that he'd heard her voice, he could see the Margo he knew.

"Yeah, it wasn't much of a contest."

Harmon said, "We did a kick-off, but I don't think we're going to run any more plays. Maybe we could catch?" Broncho and Bernardino nodded.

Arien rotated his shoulder to a chorus of sharp pains. "I'll watch."

The other boys trotted onto the field. Holding the ball, Harmon set them on a line, called a cadence, then yelled, "Hike!" He faded back and threw a tight spiral to Bernardino. Arien whistled appreciatively. Harmon might be small, but he had good technique.

From the corner of his eye Arien glanced at Margo standing at his shoulder. Caught her looking at him.

"Missed you at the game," he said.

She scuffed the ground with her foot, and put her chin into her coat's collar. "I've been on the superway since breakfast. Had to attend school from the car. I really wanted to see . . . you know . . . you guys play. I live in Toronto."

Broncho threw the ball this time. His wobbly pass didn't reach Harmon, who dove to make the catch. He came up laughing. "Look, grass stains!" He held his forearms up for them to see.

"That's a long way," said Arien. He didn't know what else to talk about. The Margo at school he could talk to for hours, but she wasn't *there* actually. He was safe behind his digital image.

"Was it worth it . . . to play like this?"

Bernardino threw the next pass. It knocked Harmon off his feet.

Her voice was the same. He thought about her sitting in class, about walking with her in the courtyards between their rooms.

"Yeah, I'm glad we did it. I don't need to do it again, though."

The silence stretched uncomfortably. Finally, Arien said, "There's a concert we're all going to. Would you like to go?"

He could hear the smile in her voice without turning to see it. "Oh, I'd love to. That would be lovely."

They didn't move toward the cars. They watched the three other boys playing catch, yelling with joy in the rain.

After a while, Arien took a shaky breath, then reached out slowly, blindly from his side, until he touched her hand. She nestled her fingers between his. He could feel her palm's silky texture, the fine strength in her hand and wrist. The rain had turned into a mist, and just before the boys quit throwing to each other to return to the cars, Arien, his heart careening in his chest, squeezed her hand.

She squeezed back.■

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The Nechtanite and the Inforat

Catherine Wells

Illustration by Nick Jainschigg

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I don't care what anyone says, there is nothing in this life that prepares you for your first encounter with a Nechtanite warrior. Even working the live interface desk at a university study center.

I had heard about Nechtanites before I accepted the position at Mal Surjan University here on Valla. It worried me less than the residual Moslem culture that permeates so many colonial worlds, and its attendant bias against women. Nechtanites are a local oddity—remnants of a warrior cult from the early days of the planet's settlement. I had even, I think, seen a picture of one, although they don't like to have their images on file. But nothing—nothing—prepares you for looking up from your desk and seeing this hideous hulk of humanity looming over you.

Nechtanites always loom. I met one later who was only five foot eight, and she still loomed. But this one was about six feet tall, with his hair braided and looped in Medusan fashion, and tattoos from hairline to—well, sitting behind my desk, I couldn't see any further than the top of his kilt; but I verified later that the tattoos went all the way to the floor. The underlying skin was pale, which made the black artwork that much more striking. They were abstract serpentine forms, and the rippling of brawny muscles underneath made them seem to crawl across his flesh like animated hieroglyphics.

I must have jumped half a foot off my chair when I glanced up and saw him there. He drew back his lips to reveal large yellowish teeth, and for a moment I thought he was going to snarl and snap those teeth at me; then I realized he was only grinning at my fright. I've seen less malevolent grins on vampires. "Aren't you going to offer to assist me?" he asked in mocking tones.

That jerked me out of it. As an inforat, one of the things I pride myself on is service to my clients. I did a research paper on the history of the profession in grad school—did you know that "inforats" is actually an abbreviation for "information retrieval, access, and technology specialists"?—and there was a time when inforats were known for being stuffy and aloof; but you don't survive long in this profession if you aren't friendly to your clients. They replace you with intelligent software, unless you can prove the value-add of human intuition and—frankly—charm.

Anyway, I was not about to let this aboriginal apparition knock me off my professional reputation. "Can I help you, sir?" I asked with my best interested-and-approachable look.

"One of my students turned in this paper," the Nechtanite said, flipping a mini-disk at me. My reflexes are not quick; I juggled the disk before I could get a grip on it, and then both he and I could see that my hands were trembling. That made him bare his teeth once more in that rictus that passed for a grin. "The work is too good to be his own, but I can't find where he plagiarized it from. Can you?"

Irritated with my shaking hands, I popped the disk into a reader as quickly as possible and brought up the file, trying not to look dumbfounded at realizing this man with the primitive body art and bulging biceps was a faculty member. I had been told when I interviewed for this position that thirty percent of the faculty are, indeed, Nechtanites; but it was only my second week on the live interface desk, and maybe the second professor who had darkened the door of the study center in that time. Most of them work from their home offices and come to campus only under duress.

Wishing this particular professor would work from home, I ran the file through my syntaxifier, parsed the entire document and then the individual sections, and studied the results. "Hm. Looks like you're right. Parts of the document appear to have been written by a native speaker born in the past two decades, with a tenth-level vocabulary;

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but the bulk of the document indicates an author who is a non-native speaker born prior to the Diversification Curriculum, with a twentieth-level scientific vocabulary but a fourteenth-level social vocabulary." I looked up at that tattooed face still looming over my desk. "Would you like me to run a check for authors in the field who match that profile?"

"Since 80 percent of the published zoologists are non-native speakers, yes," he said drily, "that would help narrow the possibilities."

So I took the data from the syntaxifier and ran it against an authorship matrix. We have access to such tools because the university is one of the top classifiers of anonymous literature on the colonized planets. It's used a lot with archaeological and historical documents, and sometimes in criminology. The tool I was using is the one that finally identified the author of that old folk saying, "It ain't over till the fat lady barfs." (Some twentieth century American athlete; I forget which one.)

While the Nechtanite waited, he surveyed the students in the study center. Actually, he nailed each one with a critical glare. Those who had been gaping at him immediately hunched back over their study stations. Those who hadn't noticed him come in—those who were actually studying—eventually looked up under the heat of his stare and, nearly without exception, jumped. One poor girl actually screamed. The Nechtanite only snorted contemptuously. "Freshmen," he said.

Now, this annoyed me. I have been a very strong proponent of the rehumanization movement in education. One of the reasons I took the job here at Mal Surjan (besides my husband being transferred to Valla) is because it is a residential campus, with students actually congregating in campus facilities, doing lab work in campus labs, even—occasionally—sitting in a classroom for an interactive discussion. It's been a hard sell, because a lot of professors don't want to be in the same room with their students, and a surprising number of students are claustrophobic when put in a room with thirty other live bodies. (Their secondary school was all remote, and frankly, they don't know how to behave in a classroom.) But studies show that face-to-face learning has a lower failure rate than remote learning, and I personally think residential study enhances the quality of life for students. So I did not appreciate this painted pedant intimidating my students.

"Excuse me," I said, "but you make it difficult for my students to concentrate when you glare at them."

He quirked an eyebrow at me, which had the effect of making the tattoos on that side of his face seem to slither up into his hair a fraction. "*Your* students?"

Suppressing a sigh, I said, "I am the inforat on duty; my job is not only to assist them with using the information resources, but to create a relaxed atmosphere conducive to study. So while they are in the study center, they are *my* students. And you," I added, smiling sweetly to take the edge off it, "are making them nervous."

Instead of being offended, he seemed amused. I would have preferred he be offended, because next he leaned over my desk and put his great crooked nose just inches from mine. "Are *you* nervous?" he asked.

I could lie, or I could amuse him further. Neither choice had much appeal. "Like most of my generation, I received a standard remote education," I told him. "Whenever anyone puts his nose in my face, it makes me nervous." The Nechtanite lingered there a moment, chuckling at my discomfiture, then drew back. "How your kind ever procreates is beyond me," he observed; then, before I could pick my jaw up off the floor at this insolence, he thumbed the ID plate on my console with the practiced gesture of one who uses the study center—and the inforat—a lot. "Send the results of that author search to me," he said as

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he turned on his bare feet and headed for the door. "I have to grade these papers by Thursday."

When he had gone, I did two minutes of deep breathing, trying to slow my heart rate. Then I looked over to see how the students were doing. They were mostly freshmen, saddled with mandatory supervised study, although a few upperclassmen had thumbed in. You may wonder why, with virtually every information resource available on the workstations in their residence rooms, they bother coming to the study center. Some of them like the quiet; others actually like the companionship. A few of them even know enough to ask an inforat for help finding an appropriate resource for their study material.

You could tell which ones were the veterans now, because they had gone back to their studying as soon as the Nechtanite left. Most of the freshmen were still gaping after him, or exchanging incredulous looks with one another. But aside from a low murmur and a few shivers, the disruption seemed to be fading. I turned my attention back to my workstation and called up the Nechtanite's record from his thumbprint.

Soln Shipner, Ph.D., a tenured professor in the field of zoology. The word "zoo" leapt out of zoology in a way it shouldn't have. If you saw some of the clothes and hairstyle these students wear, you wouldn't think tattoos and braids would draw any attention, but they did. The Nechtanite appearance is markedly fierce. Wearing pastel skin-tights and paisley neckbands may be bizarre, but it isn't fierce.

As I sent the results of the author search off to Shipner's mailbox, I tried to remember what I'd read about the Nechtanite cult. They combined scholarship and physical prowess with an emphasis on military arts—particularly hand-to-hand combat. Not that any civilized nation has conducted warfare hand-to-hand in about six centuries, but in the early days of most planets it cropped up. Valla was no exception. The Portal that serves Valla and a couple of other habitable bodies in this system had malfunctioned about a hundred years after settlement, and the population was on its own for several generations. That's when the Nechtanite culture was forged.

But that was over three hundred years ago, and today there are just a handful of communities left. Their credos "Make the body a hammer, the mind a sword, and the spirit an arrow"—is just too militaristic for modern tastes. Their lifestyle, so I'm told, is also very Spartan, which doesn't exactly attract new followers in droves. Sociologists estimate that in another two generations they will have died out completely, unless they modify the rigorous discipline imposed on their members.

In the meantime, I hoped the ugly mother didn't stop by the study center again while I was on duty.

No such luck. Three days later he was back. "Dr. Shipner!" I greeted him with a smile that probably had frost around the edges. "What can I do for you this evening?"

His eyes wandered over the students at their study stations. "I had him expelled," he said in a rather loud voice, presumably to me.

"Had who expelled?" I asked.

"The boy who turned in the plagiarized paper. I located his source: an unpublished paper by one of the authors on the list you sent me. So I had the boy expelled." He was still looking at the students, not at me. "This University has no time to waste on children who don't intend to apply their own intelligence to their work."

The freshmen tried to look very busy.

Somehow I didn't believe he told me this by way of complimenting the effectiveness of my work. "Is there anything else I can help you with, Dr. Shipner?" I asked. If not, get the *hell* out of my study center!

Finally he turned to face me. "Bats,"

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he announced. "Terran bats, prior to their transplant on Valla. Where outside the Universal Library and the Zoological Archives would you suggest I search for 3-Ds of skeletal structure?"

I whipped off a list of half a dozen other possible sources, including the name of a private collector of bat specimens. (No, it's not the weirdest thing I ever heard of. Not even close.) Shipner took it without a word, then turned and sauntered into the study area of the center, making a slow circuit.

Some of the upperclassmen looked up and nodded to him; Shipner nodded in return. But the poor freshmen! They sat there glued to their viewscreens, trying to ignore the predatory professor prowling in their midst, and not succeeding very well. One poor kid snapped a zip stylus, and another one dropped a bag of skeekeries, the latest in nonsensical toys: you toss them against a hard surface and they expand into freeform gas-filled membranes. Half a dozen of them popped when they hit the floor, and the young fellow had to scramble out of his seat to retrieve them. Shipner glared at him the entire time.

When the loose skeekeries had been corralled, Shipner moved on until he came to the girl who had screamed the first time he showed up in the study center. There he stopped, bending over her shoulder to examine the viewscreen she was pretending to read. The poor thing turned white as a ghost as his head with the snaking braids hovered inches away from her face. "H.P. Golloway," Shipner observed—a classic of twenty-eighth century Lunar literature. "Rubbish." And with that judgment, he strolled deliberately out of the study center and back to whatever dank grotto from which he came.

After that, I figured I'd better make a tour of the study center myself—not something I normally do, because students are often uncomfortable with a faculty member "patrolling." But since that's exactly what Shipner had done, I felt obliged to provide some kind of positive contact to counter his effect. I started with the girl; I had checked when she thumbed in and learned her name. "Are you all right, Alissa?" I asked quietly.

"I'm fine, thank you," she breathed, but moisture glistened in her eyes.

"Don't worry; if he bit, I'm sure they'd keep him chained up," I joked, and she managed a smile.

I wish someone *had* kept him chained up; but no, he was back again within a week, asking for something else, prowling the area where the students were trying to study, sticking his big nose—literally—into their coursework. He commented on everything—negatively, of course. He called Andronese poetry "timid" and the work of a noted Moslem psychologist "no better than camel droppings."

Frustrated by these intrusions, I tracked down another inforat who worked the live interface desk on day shift to ask if she had any experience with Nechtanites.

"Uh-oh," she said. "Let me guess: Shipner."

My eyebrows shot up in surprise.

"He's the reason you have a job here, you know," the woman elaborated. "Terrified poor Margie—she resigned within two months of being put on the desk."

My blood pressure cranked up a notch or two. "What did he do to her?"

But my colleague only shrugged. "Probably nothing. Margie wasn't cut out for working live interface. At online help, she was a whiz; but she didn't know how to deal with the students, and she certainly didn't know how to deal with Shipner."

Great! Apparently the man was an habitué of the study center. "Well, he doesn't frighten me," I boasted, "but his presence is hard on the students."

My colleague could only shrug once again. "Not much we can do about it; he's entitled to be there."

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After that I tried to read up on the Nechtanite culture, looking for some clue as to how to deal with Shipner, and maybe even ask him to back off from the students. But virtually nothing is recorded about Nechtanites, except second-hand observations. They do not commit their practices or their tenets to writing, nor do they tolerate intrusion by non-Nechtanites. Pretty strange since, as scholars, they all rely on scientific observation to advance their own knowledge. I did learn that they don't start accumulating tattoos until they're adolescents, and that each tattoo has some significance. What that significance is, only the Nechtanites know.

I couldn't believe there wasn't some tell-all somewhere by a Nechtanite who had left the cult and had an axe to grind with his former associates. I was searching the Discredited Literature database, and I had just found an item by a woman who claimed to have been raised in a Nechtanite community, when—

"Blatant fraud."

I lifted six inches off my chair again, I know I did. But he had come around behind me—no one comes around my desk, it isn't done!—and was leaning over with his mouth beside my ear before I heard him. He *sneaked up* on me, blast it, and he did it on purpose! "Dr. Shipner," I greeted, trying to keep the irritation out of my voice. "How nice to see you again."

He grinned, and I knew he could tell I was lying.

"Willful invention," he said contemptuously, tapping the screen. "Nechtanites do not copulate in full view of their offspring, nor are they given to orgies. Promiscuity, yes; threesomes, no doubt; but orgies? No. Such rubbish is intended to titillate, not to inform."

I glanced at the students, fully three-quarters of whom were watching us, and wondered *who* intended to titillate.

"Why are you reading such nonsense, anyway?" Shipner demanded, looming over me again.

"I am trying," I said with exaggerated patience, "to find out something about your people. Why, for instance, they delight in sneaking up on inforats engaged in research."

He grinned and spread his arms wide. "Why, for the sport of it!" he boomed, and I gritted my teeth at the unaccustomed volume of his voice. Then his grin turned wicked. "The same reason we copulate."

"Dr. *Shipner—!* " I hissed, but he was no longer paying any attention to me. He was headed into the study area, his hands clasped behind his back. At Alissa's desk he stopped and scowled at her viewscreen. "Austin!" he fairly shouted. "Who has you reading that drivel? Eh?"

"D-D-Doctor Hampton," she squeaked. "For Terran Lit."

"Hampton!" he snarled. "Hampton isn't qualified to teach coloring to kindergartners." Then he stomped on down the line, peering over this one's shoulder, making rude remark's about that one's assignment. Finally he came to a young man who was obviously trying to shield his viewscreen from prying eyes. Shipner had only to touch his elbow, and the boy jerked his arm away reflexively.

Shipner frowned at the viewscreen. "Girlie pictures?"

The boy flushed bright red. "M-Models," he stammered. "For my sketching class. It's an assignment, really!" As if it would help, he held up a sketchboard to show his attempts to capture the female forms with his stylus.

Shipner only grunted. "Too bad. I was hoping to confiscate your files."

The rest of the room tittered.

"Mundane assignment," Shipner declared. "Naked women are plentiful and plain. Draw something meaningful." He pointed to a tattoo on his neck. "Draw this."

The boy's Adam's apple bobbed as he swallowed once, then he applied his stylus rapidly to the sketchboard.

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"Ha!" Shipner snorted when he saw the results. "It looks like a uterus and fallopian tubes."

That was it. "Dr. Shipner," I called out sternly, rising from my desk. "I must ask you—"

Before I could finish, Shipner turned on his bare heel and made a beeline for my desk, eyes flashing. "You must *what?*" he demanded in a voice that was low and threatening. "And before you answer, remember that I am a tenured faculty member at this University, and you are a probationary infora t."

My courage failed me. "I must ask you," I finished through clenched teeth, "if I can be of any further assistance. If not, I would like to go back to my research."

Now his eyes took on a different kind of spark. "Your research on Nechtanites?" he purred. "Come by my office, I'll be glad to answer any question you want."

I was too stunned by the innuendo in his voice to respond. With a suggestive wink, he turned and left the study center.

That was it. *Nobody* talks to me that way. I dropped out of the database I was in and called up university forms. I was going to file a complaint on this man, now. Disruptive conduct, lewd and suggestive speech to a fellow employee, antagonistic behavior toward students— My fingers flew as I keyed in the charges, called up Shipner's data from the faculty registry and plugged it in, then added my own as the plaintiff. But at question seven I came to a screeching halt.

Have you discussed the offense with the alleged offender?

Discuss this with Shipner? I had to discuss this with Shipner before I could file the complaint? No wonder the woman before me had chosen to resign! How in holy halos was I going to discuss this with Shipner?

But that's what was required. Put up or shut up.

The next time he came to the study center, he didn't catch me by surprise. I was watching for him, and the minute he came through the door I was on my feet. "Dr. Shipner, I need to speak to you," I said, trying to herd him toward a corner of the room where our conversation would not disrupt the students at their studies.

You can't herd a Nechtanite. He planted his bare feet right there at the doorway and glared expectantly at me. "Well?" he prompted when I hesitated.

"Could we step over here—"

"No."

"I'd rather not do this in front of the students."

His mouth stretched slowly into that wicked grin of his. "A challenge should always be in front of witnesses," he said.

I wasn't sure "challenge" was a word I wanted to use with a warrior. But I handed him a copy of my complaint form. "I intend to file this with the University," I said bluntly.

Shipner glanced at the form, then crumpled it up and propped his fists on his hips. "A complaint form?" he said loudly. "You're filing a complaint against me?"

My heart hammered as I stood there in front of him. He looked awfully strong. Biceps twice the size of a normal human. Hard ridges of muscle visible in his bare chest. "That is my intention," I insisted.

"What charges?"

I waved a hand at the crumpled sheet he still clutched. "They're spelled out there."

"I want to hear them from you."

I looked past his jutting elbow and saw that every eye in the place was on me. "Disrupting the study center," I answered boldly. "Antagonistic attitude with students. Suggestive speech." The last one didn't come out as loudly as the first two.

All this had been delivered more or less to that damned tattoo he'd asked the boy to draw, about neck level. Now I

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finally forced my eyes upward to his face. I saw an indulgent chuckle lurking just behind his teeth; I could hear it in his voice. "Disruptive? Antagonistic? I am a *Nechtanite,*" he said deliberately. "It's *expected.*"

"*I* don't expect it!" I exploded.

Contempt dripped from his voice. "What *do* you expect, Madam Inforat?"

"I expect you to nurture these young minds!" I shouted, pointing toward the study area. "Not trample on their self-esteem!"

"Trample!" He glanced over his shoulder at them. "Do they look trampled to you?"

In fact, they didn't much. They were too busy watching us—probably waiting for me to get trampled.

He dropped his voice conspiratorially. "What do you think?" he asked. "Will any of them scream when I walk up to them, do you suppose? Will any of them jump this time?" He jerked a head toward Alissa. "If I ask that one a question, do you think she'll weep?" He raised an eyebrow. "Or do you suppose that tonight, I might get a coherent answer?"

For a moment I just gaped at him. It couldn't be—it wasn't possible that he was deliberately—

"You *do* come here to terrify them!" I managed finally.

His smirk was positively evil. "He who does not know fear," Shipner said loudly, "does not know courage."

Abruptly, he turned from me and began his usual tour through the study area, hands clasped behind his back, scowl firmly in place. But when he stopped at Alissa's desk, she took a deep breath and forced herself to look up into his face. "Melville," she said before he could ask, then added with a note of petulance, "Yuuch."

Shipner only chuckled and moved on. Next he paused to criticize a biology text, but its reader only shrugged. "I don't write 'em," he grumbled.

When Shipner reached the artist, the boy simply handed over his sketchboard. "Ha!" Shipner exclaimed as he examined it. "Print that." The boy printed off a copy and gave it to him.

Shipner carried the sketch back and handed it to me. It was a rough but recognizable portrait of the Nechtanite. And as I stared at that ugly face glowering off the sheet at me, I finally had to admit that there was a method to Shipner's madness. These kids, every one of them, had come out of remote learning programs. No teacher had ever gotten —quite literally—in their faces before. They didn't know how to cope, at first.

But they were learning.

"Go file your complaint, Madam Inforat," he told me with a sneer. "You'll find it is one of dozens. And while you're at it, file one against the forty-seven faculty members who have not seen a student face-to-face in over twenty years." Then he handed back my crumpled complaint form and added, *soto voce,* "Besides—courage learns by example."

I suppose it was a compliment. But I filed that complaint form the next day. Shipner was right, though—it only notched up the tally in his file. The university did nothing about it. So I have been stuck with the man for several years now. He makes a point of harassing every incoming class, and I do my best to see that they don't come unglued before they adjust to his belligerent behavior.

I've also worked on a number of research requests for Dr. Shipner, work for which he never thanks me. But he keeps coming back, and from a Nechtanite, I guess that constitutes praise. Sometimes when I get frustrated with his rudeness, his antagonism, his unprecedented arrogance, I pull out the sketch that kid drew, just to remind myself why I don't kill him. I can't look at that sketch without remembering the conclusion of that night's encounter.

He took another look at the sketch before he left, tapping the rendering of the tattoo that he had first demanded the boy draw. "Better," he judged.

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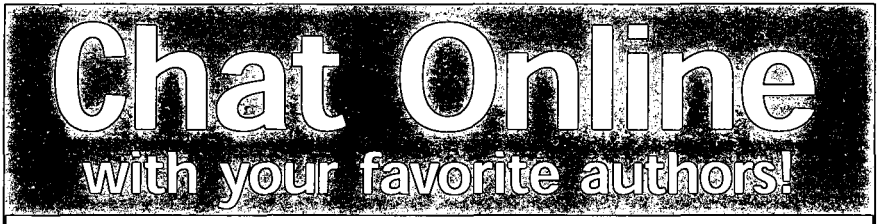
I looked at the original on his neck, then at the sketch, and thought it was a damned good likeness. "What is it supposed to be, anyway?" I asked irritably.

"This is a mystical and powerful symbol," Shipner replied proudly, fingering the mark on his skin. "No Nechtanite male is considered an adult until he bears it."

"But what does it *mean?*" I persisted, smarting from the evening's revelations and inclined to be just as ornery and obnoxious as he normally was.

With a covert glance over his shoulder, Shipner bent and put his mouth next to my ear. "It's a uterus and fallopian tubes," he whispered.

Then with a broad wink, Shipner clasped his hands behind his back, turned on his bare heel, and swaggered out. □



Hugo Nominees August 8 @ 9:00 p.m. EST
Harry Turtledove, Ian R. MacLeod, James Patrick Kelly, Jerry Oltion, Adam-Troy Castro, and Kage Baker.

More Hugo Nominees August 22 @ 9:00 p.m. EST
Connie Willis, Mike Resnick, Michael Swanwick, Eleanor Arnason, and Tom Purdom.

Colonizing Other Worlds September 12 @ 9:00 p.m. EST
Janet Kagan and Alexander Jablokov.

Go to www.scifi.com/chat or link to the chats via our home page (www.analogsf.com). Chats are held in conjunction with *Asimov's Science Fiction* and the Sci-fi Channel and are moderated by *Asimov's* editor, Gardner Dozois.

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"Put Back That Universe!"

F. Gwynplaine MacIntyre

Illustration by F. Gwynplaine MacIntyre

Us? Tell tall tales? Never!

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"This must be the place," said Smedley Faversham, as he traveled backwards in time to the very beginning of the universe, and took a look around.

The vicinity in question was a region of space just over six feet in diameter: spherical, and consisting of ionic plasma gas superheated to a temperature of ten *billion* degrees Kelvin. At this temperature, matter could not sustain atomic integrity, so the contents of the sphere had obligingly broken down into subatomic particles, photons, and a few exotic particles such as bosons, muons, gluons and the occasional quark. Of course, a plasma cloud of such extreme temperature could vaporize Smedley Faversham instantly, so he was careful to step back at least a good ten feet and watch from a safe distance as a steady trickle of protons, photons, neutrons and electrons—attracted by the gravity well of the plasma sphere—continued to be drawn into its subatomic mass.

The sphere was more precisely a *hypersphere*, because it had attained a shape of uniform radius through all the dimensions of Space: it was therefore circular, or spherical, in *all* directions . . . not merely in the three most obvious ones. The hypersphere's radius was dwindling slowly, as the immense mass of the plasma cloud forced its contents into a state of supercompression. As each nanosecond elapsed, the sphere became slightly smaller.

Smedley Faversham, intrepid time-traveler, knew that he had indeed arrived at the correct destination in space-time. The plasma sphere directly in front of him contained approximately 99.99995% of all the physical matter in the entire universe: effectively, this glowing sphere was 99.99995% of the entire universe. And since Time is a coefficient of the unified force which functions as both gravity and electromagnetism, it stood to reason that this glowing sphere also contained 99.99995% of all the *time* in the universe as well: all the time that ever *had* existed and ever *would* exist. Since this single ball of plasma gas, now slightly less than five feet in diameter (it had condensed somewhat during the past few nanoseconds), contained nearly all of the Space and Time in the entire universe, then—as Smedley had already observed—this surely *had* to be the place. Because there was nowhere else—and no*when* else—for him to be.

"Any second now," Smedley Faversham chuckled, "all the matter and antimatter in all the infinite dimensions of the universe . . . except for myself, of course . . . will be, if I may employ a technical term, *smunched up* into a non-dimensional singularity of Space-Time. One nanosecond later, it will burst forth to create the Big Bang. And *that* will be the moment," Smedley chuckled again, "when I shall put my fiendish plan into action."

Smedley watched, greedily, as a few straggling photons and baryons came rushing to converge upon the dwindling sphere, adding themselves to its mass. According to Smedley's calculations, there were only 217 subatomic particles of matter or antimatter (not including his own constituent molecules, and the molecules of his clothing and equipment) still remaining in the entire universe beyond the hypersphere. When those last few particles had entered the hypersphere's inexorable gravity well, Smedley's task would begin.

"The more the merrier," said Smedley Faversham, nodding his approval as a few more latecomers (a graviton, a fermion and a neutrino) came rushing to join the swirling eddy of the plasma cloud . . . which by now had condensed to a diameter of forty-seven inches. "Soon, the Big Bang will begin. In the first two minutes of Time, the temperature of the plasma hypersphere will reduce by a factor of ten as its volume expands. This will allow the formation of simple isotopes, such as helium, protium, and tritium. From those few sim-

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ple building blocks, the entire universe will be built. Unless, of course . . . ," here Smedley Faversham chuckled again, ". . . *I* decide otherwise."

At this point, the Gentle Reader may wonder how Smedley Faversham was able to stay alive, since the oxygen molecules necessary for breathing (to say nothing of chuckling) had not yet been created by the cosmic aftereffects of the Big Bang. Hence, thus, and consequently there was no air for Smedley to breathe while he was standing at a slight distance in Space-Time from the creation of the universe. For that matter—or *lack* of matter—there was nothing solid for Smedley to be standing *on*, since all of the atomic mass in all the infinite dimensions of the universe (minus 189 subatomic particles which still hadn't arrived yet, and Smedley himself) had already converged into the all-consuming hypersphere. By this same application of pitiless logic, the Gentle Readers may also wonder how Smedley was able to *see* the hypersphere, since nearly all the photons in the universe were now *inside* the gravity well of the sphere, beyond reach of Smedley's optic nerves.

The Gentle Readers should mind their damned business.

For those who spitefully demand an explanation, however, here it is: the rules which govern the structure and function of Space and Time within the matter-energy universe are necessarily a *part* of that universe, and must therefore exist *within* it. Smedley Faversham had positioned himself *outside* the borders of Space, Time and the Universe (having stepped three paces back, and slightly to the left), and so he now existed *outside* Space and Time and all the rules which govern the interaction of matter and energy.

Now are you happy?

Smedley Faversham's stomach rumbled, reminding him that he had not eaten since the year 2193 . . . which was now sixteen billion years downstream in Time, give or take an eon, from his present location. He reached into his tuckerbag and retrieved a double portion of Curry Vindaloo takeaway, which he had purchased *en route* to the Big Bang during a stop-over at the Kurry Kebab King all-night restaurant in Stoke Newington. Now he unwrapped the takeaway, and he thoughtfully munched curry vindaloo as he watched the arrival of a few more subatomic particles. The hypersphere by now had dwindled to less than a yard in diameter, and very soon the Big Bang would begin.

"That was delicious," said Smedley Faversham, as he carefully deposited the waxed-paper wrapper of his takeaway dinner into the vortex of the hypersphere (it always pays to be neat), and he fastidiously wiped a few bright-orange stains of vindaloo sauce from his fingertips as the molecules of wax and paper and leftover vindaloo were broken down into their atomic components, and the atoms in turn were rendered to their subatomic smithereens. "Of course, curry vindaloo always gives me heartburn, and sometimes—*urp!*—a few *other* digestive problems as well," added Smedley, stifling a belch as the departed vindaloo made a brief attempt at resurrection. "But I do enjoy a good curry, and the heartburn will keep me warm. Entropy won't begin until the Big Bang gets cranked up, so I'll need a heat source in the meantime. And when it comes to internal combustion, there's nothing like—*urp!*—a good curry vindaloo to keep the home fires burning, digestion-wise. Hello, what's this?"

While Smedley Faversham was rhapsodizing on themes vindalooish, the universe around him (or, rather, the hypersphere directly in front of him, and slightly to the right) had merrily continued dwindling. By now it was thirty inches across and still shrinking, while several more of the last remaining subatomic particles in the myriad dimensions of Space-Time flung themselves lemminglike into the vortex. But Smed-

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ley's attention was distracted by something else altogether: coming towards him, at a velocity beyond the speed of light, was one particular subatomic particle which somehow seemed quite different from the rest.

Most good little subatomic particles, of course, will never *ever* go beyond the speed of light. (They also look both ways before crossing into another quantum level.) But this particular subatomic particle was neither good nor little. This subatomic particle was the same size and shape as a very stout man. With a potbelly. It even *wheezed*, which is something that subatomic particles seldom do, but which stout men with potbellies do frequently. Also, this subatomic particle was wearing lapels. And pinned to one of those lapels was a small silver badge depicting a balance scale superimposed across an hourglass: the scales of Justice and the sands of Time. The symbol of the scales and hourglass is interchronally recognized in all centuries and millennia as the emblem of the Paradox Patrol, and it is worn solely by the valiant officers who walk the beats of Time. It is never worn by subatomic particles. And yet the object hurtling towards Smedley Faversham at hyperlight velocity was indisputably a subatomic particle, because its outer surface was neatly emblazoned with the words **I AM A SUBATOMIC PARTICLE. I AM NOT A LAW ENFORCEMENT OFFICER IN DISGUISE.**

"Hmmmm," said Smedley Faversham. "I can't help but notice something odd about this particular subatomic particle. It utterly defies classification. I'm positive it's not a positron, and I knew it's no neutron. It's firmly not a fermion, and it's definitely not a proton, boson or muon. It's tacky enough to be a tachyon, but it looks more like a moron. When it gets closer, perhaps I can identify it by the sound it makes."

"Quark!" said the oncoming particle, between its own wheezes. *"Quark, quark, quark!"*

"Aha!" said Smedley Faversham. "Something tells me that this is a quark. But which variety? It certainly has no *charm* worth mentioning. It must be a *strange* quark. Let me see if I can counteract its spin."

So saying, Smedley Faversham stuck out his right foot, which was impeccably shod in a crisp white pearl-button spat. The onrushing quark emitted a loud "OOF!" as it tripped across Smedley's foot and fell tumbling butt-over-appetite (perhaps it was a *down* quark) into the empty void between Smedley Faversham and the glowing hypersphere. Having already oofed once, the quark now repeated itself: *"Oof!"*

"I'd know that oof anywhere," said Smedley Faversham, ripping off the newcomer's cheap disguise to reveal the sweaty brow and glaring countenance of a red-faced chrono-constable with a walrus mustache. "Well, well!" Smedley jeered. "If it isn't my favorite fourth-dimensional flatfoot: none other than Nougat Callender of the Paradox Patrol!"

"Must you always mispronounce my name?" asked the stout man, rising to his feet and brushing off a few flecks of dust . . . which hastily added their molecular mass to the vortex of the nearby hypersphere. "The name is *Newgate* Callender, if you please. My parents were in law enforcement, so all of my brothers and I were named for famous prisons: Broadmoor, Pentonville, Leavenworth, Clink, Ford, Colditz, Borstal, Bastille, and so forth. My dear sister is named Lubyanka. There's also a cousin I'm not too sure about, named Strangeways."

"Sorry, Nugget," said Smedley Faversham spitefully. "What brings you to this neck of the space-time continuum? And what's with the quark getup?"

Newgate Callender blushed. "The top brass at Paradox Central have got me assigned to plainclothes duty. I'm supposed to blend in with the local inhabitants of whichever time-beat I patrol, so

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that I avoid committing an anachronism. I had to wear a toga at Pompeii in 79 A.D., and I wore galligaskins and a doublet when I handled the Christopher Marlowe murder case. Then I wore a farthingale during the Great Fire of London, and . . ."

"Wait a minute," said Smedley Faversham. "Isn't a farthingale *a woman's dress?*"

"It *is,*" said Newgate Callender. He was already blushing; now his red face turned several vermilion times redder. "The research department really screwed up on that assignment. But it gets worse: when I went after a crimelord in the Devonian Period who was manufacturing counterfeit trilobites, I had to disguise myself as a cycad." Callender shuddered at the memory. "Nasty buggers, trilobites! Utterly useless, too."

"I disagree," said Smedley Faversham. "Trilobites are quite useful. I recently wrote a poem about cybernetics, and I needed a rhyme for *'kilobytes'*. But why are you—*urp!*—here at the Big Bang?"

"Several minutes *before* the Big Bang, actually," said Newgate Callender. By now the hypersphere had dwindled to a mere seventeen inches in diameter: in a few more minutes, it should attain absolute nullity as a zero-dimensional point in space-time, and the Big Bang would commence. "We got a report at Paradox Central of unauthorized time-travel in the vicinity of the Big Bang, so I was sent here to investigate. I should have known I'd find *you*, Faversham."

Smedley Faversham lowered his eyes modestly. "You honor me, Nought."

"The name is *Newgate!*"

"Whatever. Still, aren't you a tad premature? I haven't actually committed a crime yet. You don't dare arrest me *before* I commit a chrono-crime: you would violate causality."

"Just your *being* here is crime enough, Faversham," grunted Newgate Callender. "For one thing, how did you even *get* here? I know you're a time-traveler, but Time didn't actually get started until the Big Bang . . . so how did you manage to show up *before* Time began? That's like attaining a temperature *below* absolute zero: nobody can do it!"

"Evidently you never met any of my ex-wives," said Smedley Faversham. He glanced at the nearby universe: by now it had shrunk to the size of a basketball. "You see, my dear Naugahyde . . ."

"Newgate!"

"Whatever. Going back to *before* the beginning of Time was quite easy. I merely had to set the controls of my time machine to go *all* the way back to where the tachyons end. Then, after I'd gone as far yesterwards as the time machine would take me, I got out and *walked* the rest of the way. And, of course, as a lifelong criminal and all-around nogoodnik, I'm just naturally a predator . . . so it's easy for me to *predate* everything, including Time itself. How about *you*, Noogie: how did *you* manage to arrive on a timeline before the beginning of Time?"

"Well, that's just the thing." Newgate Callender coughed nervously. "By existing *before* the beginning of Time, Faversham, you've automatically extended the parameters of existence to include yourself. You've moved the goalposts of the universe, as it were. And you got here ahead of me . . . so it was easy enough for me to arrive at a Space-Time nexus which—thanks to your trailblazing efforts—was already defined *within* the borders of existence."

"Again you honor me, Nougat, old boy," said Smedley Faversham, once more lowering his eyes modestly. "Really, though: if I'd—*urp!*—if I'd known that you'd be coming here too, I would gladly have given you the honor of *preceding* me to the beginning of Time. You would have beaten me to it."

"The only thing I want to beat you to is a pulp," said Newgate Callender of the Paradox Patrol, whipping out his truncheon and appraising certain less essential portions of Smedley's cranial region.

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By this time, the dwindling hypersphere of the pre-Big Bang universe had dwindled to the size of a softball. "Why not just give up whatever time-crime you're planning and come along quietly, Faversham? I've caught you orange-handed."

"I think you mean *red*-handed . . . ," Smedley started to say, until he noticed the telltale stains of curry vindaloo still clinging to his fingertips. He hastily dipped his fingers into the super-heated plasma orb of the hypersphere, wiping them clean, while he stifled another belch.

"I've got you dead to rights," said Newgate Callender, taking out his handcuffs. "I don't know what kind of chrono-caper you were planning here, Faversham, but I'll bet it would have been a real doozy . . . *if* I hadn't shown up to stop you. Why not make a full confession? You might get a lighter sentence."

"Very well." Once more Smedley Faversham lowered his eyes, surveying the contours of Newgate Callender's trousers to determine if they contained a wallet or anything else worth stealing. Meanwhile, Callender had whipped out a small notepad and a Number Two pencil, and he began taking down the full text of his prisoner's confession.

"Actually, officer," Smedley Faversham began, "I was—*urp!*—I was biding my time until the precise nano-instant *before* the Big Bang. At that moment, the universe would have contracted to a pinpoint." Smedley Faversham held two fingers a hair's breadth apart, indicating a minuscule object. "All the dimensions of Space and Time would be compressed into the smallest possible increment."

"How small?" asked Office Callender, scrawling industriously in his notepad. "I'll need some specifics."

"Pretty small," said Smedley Faversham. "I'd say teensy-weensy."

"Don't get high-tech with me," said Newgate Callender. "Are you sure you don't mean itsy-bitsy?"

Smedley Faversham reconsidered his verdict. "Bigger than teensy-weensy, but smaller than itsy-bitsy," he conceded. "Better make it teeny-tiny."

"Now you're being specific," said Newgate Callender approvingly, and he jotted this down in his notepad. "Okay, so you were waiting for Space and Time to form a teeny-tiny singularity. *Then* what?"

"And then," Smedley Faversham went on, "just before the universe could expand into the Big Bang, I was planning to *steal* it."

"You *what?"* Newgate Callender was so astonished that he dropped his pencil. It hung dangling in the void, and Callender retrieved the pencil just as it was about to be sucked into the gravity well of the hypersphere, which by now had dwindled to the size of a small grapefruit. "Wait a minute! You were planning to steal *the whole universe?"*

"All of it," said Smedley Faversham, looking shamefaced and penitent. "Every last micron of Space, and every single quantum increment of Time. The whole shmear. Of course, after stealing the universe, I was planning to file off the serial number, so that nobody could prove I didn't buy it legitimately. Then I was planning to disguise it for resale."

Callender made a choking noise. *"Disguise* the universe?"

"Sure. I could give it a dye job. Paint the galaxies black, so that they look like dark matter, and then . . ."

"Never mind that part," said Newgate Callender. "How were you planning to steal the universe?" The chrono-constable nodded towards the glowing orb nearby. "That's a concentrated ball of ion plasma, superheated to a billion degrees! Were you planning to pick it up in your *bare hands?"*

"Of course not," said Smedley Faversham, reaching into his cummerbund and taking out a pair of oven mitts.

"But . . . but . . . but . . . ," Callender spluttered, "after you decided to steal the universe, *what were you planning*

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to do with it?"

"Hock it, I guess," said Smedley Faversham. "Or maybe sell it to the highest bidder. I could cut it up into smaller pieces—like a stolen diamond—and sell chunks of Space and Time wherever I could unload them. I could break up the universe into separate galaxies, and sell 'em one at a time. If anybody asks where I got the galaxies, I'll say they fell off a truck. Or else I could—*urp!*—I could hold the whole damned universe for ransom."

Newgate Callender's walrus mustache quivered with indignation. *"Ransom?"*

"Sure, why not?" Smedley Faversham shrugged. "I figure the entire space-time continuum must be worth *something*, even at street value. I could hold the universe for ransom, and threaten to rough it up a little if the ransom wasn't paid fast enough. Surely, in the Milky Way galaxy alone, there must be several hundred intelligent species that would chip in a few bucks to get their universe back safe and unharmed. They could take up a collection, or pass the hat. Although, from what I understand, not all of the intelligent species in the Milky Way have hats. Several of them don't even have heads. But some of them have *multiple* heads, so I guess they all average out to one head apiece, and . . ."

"That's a brilliant plan," Newgate Callender interrupted. By now the still-contracting hypersphere of the universe had dwindled to the size of a greengage plum; Callender stood protectively in front of this as he confronted his prisoner. "But there's just one tiny little flaw in your scheme."

"I think not," said Smedley Faversham. "My seam is schemeless. I mean, my scheme is seamless. *Urp!* Excuse the belch, please. Too much vindaloo. If I keep breaking vinda, I'll need a trip to the loo. Okay, I'll bite, Nougat: what's the flaw in my plan?"

"Very simple," said Newgate Callender. "If you steal the primordial universe, and prevent the Big Bang from occurring, then Time and Space will never exist! All matter, all energy, all stars and planets and life-forms throughout the universe will be nullified retroactively. And *so*, Faversham," the chrono-constable leaned forward and grinned, "if you hijack the universe *before* it comes into existence, then *who would you possibly sell it to?"*

"I never thought of that," Smedley Faversham admitted. "You've given me something to chew on, Nougat: what good is stealing the universe if I can't hock it, fence it, or ransom it?" There was a pause while Smedley ruminated, during which the hypersphere became a few microns smaller. Then Smedley snapped his fingers. "I've got an idea! I can always sell *this* universe to the inhabitants of an alternate universe! They can melt it down for scrap, and recycle the dark matter for . . ."

"Look around, bub," said Newgate Callender, with a genial wave of his hand. "Do you see any alternate universes?"

Smedley looked around. Except for himself and Newgate Callender and the vast infinite void, the only matter or energy or space or time which existed was the single nearby hypersphere, which by now had dwindled to the approximate size and shape of a strawberry.

"There *are* no alternate universes!" Newgate Callender crowed triumphantly. "They won't be created until *after* the Big Bang . . . and they'll be created from the same cataclysmic event which created *our* universe. If you prevent the formation of one universe, you nullify them all." Newgate Callender rocked back and forth on his heels, looking pleased with himself. "I know all about this stuff, Faversham. When I joined the Paradox Patrol, I had to study cosmology."

"Really?" Smedley Faversham looked impressed. "You mean, mascara and lip gloss and . . ."

"Not *cosmetology*, you fool!" Callender harrumphed. "Your scheme has

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failed, Faversham. You might as well surrender. Give up this mad dream of stealing the universe."

"Never!" said Smedley Faversham. "I'm still convinced that the—*urp!*—the universe is worth stealing, even if it has no resale value. I have a theory: if I change the quantum structure of the universe in the past, I can alter the future so that my relatives will never be born. That's my nonrelativistic quantum theory. And now, if you'll step aside, time-copper, I'd like to . . . hey, what's this?"

Coming towards them at the speed of light was a single electron, glowing faintly. Beyond that electron was nothing but infinite void. Smedley Faversham and Newgate Callender both knew what was about to happen: this single electron represented the very last quantum increment of unclaimed matter or energy (excepting themselves, of course) in the entire realm of existence. And when this final electron joined the hypersphere of superheated ion plasma, the concentrated vortex would attain critical mass. It would rapidly compress even further, dwindling down to a nondimensional space-time singularity . . . and then the mighty Big Bang would erupt.

Smedley Faversham and Newgate Callender both held their breaths (there was no air left, anyway) as the very last straggling electron entered the gravity well of the superheated ion mass. The hypersphere shrank to the size of a kumquat, then a grape, then a raisin . . .

And then it stopped.

The universe, evidently, had no intention of contracting any farther. The Big Bang had been postponed indefinitely.

Newgate Callender unclipped some sort of high-tech gizmo from his belt, and he proceeded to wave this (the gizmo, not the belt) above the tiny raisin-sized and highly concentrated universe. "Well, Faversham, you've done it *this* time," he announced.

"Who, me? Done *what?*"

"The large amount of energy which you expended to time-travel back to the Big Bang has been subtracted from the total amount of matter-energy in the universe," said Newgate Callender. "There isn't enough matter-energy left to begin the quantum interphase reaction. In other words, Smedley Faversham: you have *prevented* the Big Bang. The universe will never happen, and it's all your fault."

"Oops," said Smedley Faversham. "Sorry about that."

Newgate Callender stepped forward, and slipped his handcuffs onto his adversary's wrists. "Smedley Faversham, I hereby charge you with the murder of everybody in the universe. I also charge you with the malicious destruction of all public and private property in the universe. In fact, I charge you with the destruction of the entire universe. You're *really* in trouble, Sunshine. Let's go."

"Where do you propose to take me?" said Smedley Faversham. He pointed towards the tiny raisin-sized nubbin of space-time, which had stubbornly refused to Big Bang itself. "If the universe doesn't exist, then there—*urp!*—there aren't any prisons or courtrooms or police stations. There aren't any laws either, I might—*urp!*—I might add. Even the law of—*urp!*—the law of Entropy doesn't seem to be valid."

"I'll think of something," said Newgate Callender, and tugged the chain of the handcuffs. "Let's get a move on, Faversham!"

"Wait a minute," said Smedley Faversham. His complexion had taken on a definite greenish hue. "Wherever we're going, could we stop off at a—*urp!*—at a lavatory on the way there? A certain curry vindaloo I ate for lunch is starting to come back from the dead, and I . . ."

"There *are* no lavatories any more, thanks to you," said Newgate Callender. "You'll just have to hold on as best you can. Oh, I almost forgot." The chrono-constable reached towards the tiny raisin-sized remnant of space-time which

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was all that remained of the universe. "I'll have to draw a chalk line around this, and rope it off as a crime scene . . ."

"The hell you will, flatfoot!" With a savage thrust, Smedley Faversham shoved the Time Cop aside and leaped forward. "If *I* can't have the time-space continuum all to myself, then *nobody* can have it!"

Cackling like a maniac, Smedley Faversham snatched the tiny lump of matter-energy, brought it towards his mouth, and . . . *swallowed* the universe.

Newgate Callender sighed, and made another memorandum in his notepad. "As if you weren't in enough trouble, Faversham . . . *now* I'll have to charge you with destroying evidence."

"You couldn't charge a battery in a lightning storm, fatso," jeered Smedley Faversham. "I'm—*urp!*—I'm walking out of here, and I'm—*urp! urp!*—I'm taking the universe with me. And there's no way you're—*urp! urp! urp!*—stopping me, so . . ."

Suddenly Smedley Faversham moaned. He keeled forward, clutching his gut. His face, which had formerly acquired a greenish cast, now turned the precise same shade of orange as a double takeaway order of curry vindaloo. He started to froth at the mouth . . .

At that instant, Smedley Faversham felt as if the entire universe was exploding. Literally. And, since the entire universe was now inside his digestive tract . . .

Smedley Faversham regained consciousness in a hospital bed, spread-eagled face upwards, with his limbs (all five of them) shackled to the bedposts. A face, blurred and indistinct, was swimming through his field of vision. Now the face turned over, did the backstroke, and continued swimming in the opposite direction.

"Where am I?" quavered the intrepid time-criminal Smedley Faversham. "For that matter, *when* am I?"

The face above him resolved itself into the sharp nose and steely gaze of Newgate Callender's nephew Gregorian, a uniformed Paradox Patrolman. "You're in the infirmary at headquarters, Faversham," the young officer informed his prisoner. "Uncle Newgate told me all the details of your latest caper."

"Well, tell *me*, then," said Smedley Faversham. "How did I get here? For that matter, how did the universe regain its existence? Wha' hoppen?"

"Thanks to your time-crimes, the universe didn't have enough energy left to complete the Big Bang," said Gregorian Callender. "But the heartburn inside your gut supplied just enough thermal activity to trigger the matter-energy interphase, and the combustion of the curry vindaloo finished the job. When you swallowed the universe, Smedley Faversham, you created the Big Bang . . . *inside* your digestive tract."

Smedley Faversham shuddered. "But, but . . . obviously *I'm* inside the universe now, instead of the other way around. Did I manage to cough up the universe before it expanded to . . ."

"Cough up? Not *cough*, exactly, and not *up*, exactly, either." With one thumb in midair, Gregorian Callender made a *downward* motion. "Let's just say that curry vindaloo is notorious for the speed at which it passes through the human digestive system. *Southward* bound."

Smedley changed color again, this time turning red with embarrassment. "Do you mean to say that I . . ."

"Yes, you did. All of it. Every quantum of space-time in the universe went through your intestines and out the obvious orifice like grease through a goose. *While* the universe was expanding, I might add. The lab boys are still cleaning up the mess you made. This will certainly make an interesting addition to your arrest record."

"Speaking of which," said Smedley, stirring impatiently in his shackles, "you've got nothing to hold me for, Callender. My caper didn't hurt anyone—

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except myself—and I didn't damage any property. So, since my actions had no lasting effects . . ."

"Oh, I wouldn't say that," said Gregorian Callender. "Look at these." He keyed up several files on a nearby computer terminal, and turned the monitor so that Smedley could see the images onscreen.

"I recognize those," said Smedley Faversham. "They're standard radio-telescope charts, charting the borders of the universe."

"And thanks to your meddling, Faversham," said Gregorian Callender. "The universe is now *expanding*. Rapidly."

"So what?" jeered Smedley Faversham. "The universe has *always* been expanding. Stars and galaxies are moving away from each other constantly, towards the longer wavelengths of the electromagnetic spectrum. Surely you're aware of the red shift."

"Not any more," said Gregorian Callender. He moved the monitor slightly closer to Smedley Faversham's hospital bed, and then handed him the keyboard. "Look again . . . and try inputting the rate and direction of Entropy as a coefficient."

Straining against his shackles, Smedley Faversham typed a sequence of commands into the terminal, and then gasped as he saw the results. Yes, the universe was expanding. The stars and quasars and nebulae and galaxies were indeed moving away from each other, their individual Doppler shifts modulating at various speeds towards the red end of the EM spectrum. But none of them ever got there. All the various components of the universe were terminating their Doppler shifts within the *orange* portion of the electromagnetic spectrum. To be specific, they were stopping within a wavelength of visible radiation which emitted spectroscopic lines of a bright orange hue looking exactly like . . .

"Curry vindaloo!" said Smedley Faversham, in a voice tinged with doom.

"Precisely," said Gregorian Callender. "Well, Faversham, you've done it again. Only *this* time, you've left your permanent mark on the entire universe. Some of us here at Paradox Central want to lock you up for this. Unfortunately, we can't." Officer Callender looked slightly embarrassed. "Apparently, Faversham, you were *outside* of Space and Time when you swallowed the universe. And since the scene of the crime was located *outside* space-time, then it stands to reason that the crime never took place anywhere in Space . . . and it never happened anywhen in Time, either." Sighing wearily, Gregorian Callender produced a key and proceeded to unlock Smedley's shackles. "Looks like you've beaten the rap . . . *again*, Faversham."

"I'm free to go?" asked Smedley Faversham.

"Better than that," said Gregorian Callender. "My sister Julie Anne just busted a gang of time-traveling creationists who went back to Olduvai Gorge during the Pleistocene epoch and tried to murder all the hominids. Julie's been recommended for promotion, and she and I and Uncle Newgate have decided to celebrate. Julie likes Chinese food, so we've made dinner reservations in the early Ming Dynasty: my sister says that's the best place for thousand-year-old eggs. Anyway, Faversham, for some reason Julie wants you to join us for dinner. Care to come along?"

"I'm not hungry," said Smedley Faversham. ■

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The Perfumed Heart

People have a great ability to redefine terms to their own advantage. But how far can they go?

Charles L. Harness

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To see Juliette and talk to her you'd never suspect that she was an artificial woman. Yes, she had been created by the famous biogeneticist Paul Machen.

This is how I met her.

My name is Joe Kemp. I'm the newest, and probably the lowest-paid, junior associate in a firm of patent lawyers in Columbia, Maryland.

Marie, our receptionist, brought Dr. Machen and Juliette into my little office one pleasant June afternoon. Marie picked me because the invention was a perfume and I was the designated expert in Class 424 compositions. (That's deodorants, shaving lathers, mouthwashes, body powders, perfumes and such.) At that point Marie didn't know who Dr. Machen was or that Juliette was . . . what she was. I had a pretty good idea. I had read about them in *Science*.

There was barely room for all three of us to sit around my desk. Marie was curious, but had to leave.

Dr. Machen cleared the air right away. First, he addressed the woman. "Juliette, my dear, you will forgive me if I talk about you." And now back to me. "Mr. Kemp, I constructed her over a period of time. She has an extraordinary aggregation of physical and mental implants that give her the intellect, sophistication, and maturity of a twenty-five-year-old woman."

Ah, I got it. "You want to patent her?"

The idea seemed to surprise him. "Oh, dear no. *She* has invented what seems to be a very fine perfume. Rather like the Chanels, but she believes she can make it a lot cheaper. She wants to patent her new perfume."

I sniffed. A faint odor had come in with them. The woman noted the gesture. "That's me. New-mown hay. That's not it."

"Oh."

She opened her purse and handed me a little glass bottle.

"This is it?" I pulled the stopper and passed the bottle under my nose. "Hm. I'm no expert, but to my uneducated nostrils it has a fine odor."

Juliette smiled, as though to say, how would you know? "We call it 'Evening Star.' It's for women, Mr. Kemp. Rather subtle and delicate, we think. Goes well with theater parties, dances, receptions. It works best after dark."

I got it. In her view perfumes had a job to do. Interesting idea. Interesting lady. I restoppered the bottle and returned it. I asked Dr. Machen, "You said *she* wants to patent it?"

"Yes."

I had trouble with that. "She—?"

"*She*, Mr. Kemp." His brow wrinkled. "Is there a problem?"

"Not really, I guess. You *programmed* her to design a new perfume, and she followed the program and came up with the perfume?"

"No, it didn't happen that way. Juliette is not a computer. She cannot be programmed any more than you can, Mr. Kemp. This perfume is entirely her idea, her own invention."

I studied her, almost brazenly. She was beautiful. Black hair in a page-boy cut, high ivory cheekbones, hazel eyes, very red lips, now lifted in faint amusement. I could see hints of nipples through her rather plain thin gown. I jerked my eyes away. "Okay . . . whoever . . . For starters, we should make a preliminary search . . . a 'pre-x' . . . make sure the perfume's novel before we draft the patent application. I'll need some information."

"Juliette has everything. I'll leave her with you. You won't need me for this."

He left. Juliette and I had a long talk, during which she explained a lot more.

"Paul's wife died of inoperable cancer," she said. "Julia was young, very beautiful. Her death broke him up. He tried to recreate her. I'm the result. I look like her, walk like her, talk like her. But I'm not her. I'm me. He finally realized it was all quite insane. So he brought me here, helped me equip a lab, got me started in the perfume busi-

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ness."

I got the picture. Juliette was at once Machen's Taj Mahal—his monument to a vanished dreamland—and also his fruitless attempt to resurrect the dream. I suddenly understood that I was at once in the presence of a mass of myriad electrical circuits and a magnificent suprahuman spirit. It was awesome. Yet, in an almost beautiful way, I could sense tragic overtones.

She continued. "He wanted me to be able to make my own way, be independent of him. My perfume shop keeps me occupied. The retail end is doing well. I have all I need—a roof over my head. Save for occasionally replenishing my essential oils, I consume nothing organic. I make enough money to buy a new nuclear cell every six months, enough clothing to keep up appearances, a few little personal things that make me look human. Paul comes in from time to time to check on me. Like for this patent thing. He says he thinks some of the big cosmetic people will copy my perfume unless I get a patent."

I was thinking the same thing.

"You mentioned making a search," she said. "What will you need for that?"

"Just the composition. It's five minutes work on the computer." I looked at my watch. "It's six-thirty. Why don't we hop over to Clyde's for a sandwich?"

"I don't eat, Joe. Remember?"

"Oh. Yeah."

She handed me a sheet. "It's all listed. Why don't you go ahead with that, while I get you a sandwich and coffee?"

"Okay. Down the hall, in the fax room."

I had the results by the time she returned. Novel, probably patentable. "I'd like to look at your data, lab notebooks and so on," I said. "We'll need several examples for the patent application, with some percentage variations in the main components."

"Lots of examples and records," she said. "Over at the lab. I'll go get them."

"You could bring them in tomorrow."

"It's just across Route 29, in Technopark. I'll be back in half an hour."

And so she was.

We got to work.

There was a lot of data to go through—not only her own experiments, but also several references in the prior art that I had to analyze and "distinguish over." It was two-thirty in the morning when she signed the Declaration and I faxed the last sheet of the case in to the Applications Branch in the Patent Office.

I turned to her. "I'll take you home."

"No, I'll get a cab." She reached for the phone.

I pulled her hand away. "Not good. Look, we have overnight facilities here in the office. Your own little roomette. Rough, but private."

Her eyes may have narrowed for a millisecond. Then: "I'd like that."

Sometime during what remained of the night something woke me. I raised my head a little. I sniffed. The odor was faint but definite. This wasn't new-mown hay. It wasn't Evening Star. This was a new one. It was neither delicate nor subtle. Not brazen, really, but not shy either. Maybe in between. With perhaps a touch of Eros? I was suddenly alert. "Juliette?" I fumbled for a light switch.

"Please don't turn on the light. May I come in?"

"Of course." I blinked in the dark, but I could see nothing. "Is anything wrong?"

"No. Everything's fine. I'm sorry I woke you up. I just wanted to see how you looked, asleep."

I realized then that she could see in the dark. "You've got infrared?"

"Over a considerable range."

"You're a remarkable woman.

She paused, as though to think about that. "I guess Paul didn't tell you much about me "

"No, he didn't." I sat up on my cot. "I'd like to know about you, anything you care to tell me."

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"All right." She sat down next to me. She was nude. I felt the warmth of her body. Where was this going? I put my pillow in my lap. Her odor was now overwhelming. She asked, "May I sit down?" I laughed weirdly.

She began to explain how she had been created.

After a time I put my arm around her shoulder and, rather tentatively, I kissed her. She fell silent. My hands began to rove. And I was thinking, what the hell am I doing? Rule One—never never never make a pass at a client. Never . . . but I couldn't stop.

Now, I enjoy the occasional company of women, but I'm not a womanizer. From time to time I have had a live-in girlfriend, the last one over a year ago. She had tried to be kind in her departure. She bought flowers and propped a note against the bowl. "Joe darling, it would never work out. Basically I think the patent game has destroyed you as a man. There's nothing else in your life. Perhaps one day you will find someone willing to take you, patents and all." I put her note with the others and was glum for a while.

This was . . . different.

The thing that awoke me the next morning was the little bell on the coffee machine in the fax room. I looked at my watch. Seven-thirty. Daylight. She was already up and making coffee. Just for me. None for her. She needed nothing. Her nuclear pellet would last for months, and all her moving parts were sealed in oil. I knew that much about her. I stumbled to my feet and peeked into the fax room on my way to the bathroom.

She greeted me cheerfully. "Good morning!"

I grinned. "Back in a minute." Quick shave, shower. Staff would be coming in soon.

As I shaved I searched my mirrored face for answers. Not much there. All very strange. Mentally, she had been—for lack of a better word—experienced. Physically, though, she had been—again for lack of a better word—a virgin. Of that, I was certain. And *she* had seduced *me*. There was no other way to call it.

All per Paul Machen? As I shaved I thought of the dark satyr face of the famous scientist. Had Machen planned *this?* Was last night just another stage in the programming of a fantastic machine? Was her body odor designed as a triumphant aphrodisiac? Paul, you bastard, did you bring us together just to complete her education? As Professor Joe Kemp maybe I should send you a bill? No! The seduction had been clean, honest. It had been good. It had been extraordinarily good. Paul Machen be damned. Still . . . sex with a machine . . . some sort of sophisticated self-abuse? They'll laugh at you, Jocko. Not everybody, though. Some will envy you. And all will wonder. Especially me.

By the time I was out of the bathroom she had gone. She left her lab notebooks, a rumpled cot, and a faint tantalizing scent. New-mown hay? Puzzling. Last night it had seemed more like musk. Did she carry samples around with her? I didn't think so. Evening Star was the only bottle she had brought in. Most odd. No matter. To business again. Have Marie make up the new files, tell her how many hours to bill. Juliette had left her daily journals. Those, I'd have to get back to her, pronto. Good excuse to visit her lab. This afternoon?

Right after lunch.

One might expect a perfume lab to be strongly odorous. Hers was not. Just . . . pleasant. And even that gradually muted to near neutrality with continued exposure. "Olfactory habituation," she explained. "An hour out there in the smog, and you'll have your smeller back again."

We made the tour. "I grow all my flowers and shrubs here in the hothouse. In this corner, the aromatics—lavender, rosemary, geranium, roses, cloves, cinnamon, others. I steam-distill

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them for the essential oils. Tree parts I buy—sandalwood eucalyptus, bark, leaves. Some flowers—jasmine, hyacinth, violets—are too delicate for steam distillation. For them I use gentler methods." She pointed to a setup under a hood. "Here's an ether extraction of a kilo of gardenia petals. I'll get a few milligrams of oil."

We passed a glassed-in case. The shelves were loaded with stoppered bottles of brown glass. I tried to read some of the labels.

"It's in code," she said. "I was trying to guess at some of the great perfumes of history." She unlocked the door and took out a jar. "Cleopatra bathed in asses' milk, scented, we think, with a blend of musk and carnation, with maybe a trace of anise." She loosened the stopper a little.

I sniffed. I recognized the scent. From last night. It had flowed from Juliette as she sat beside me on my cot.

I searched for words. "Very . . . ah . . . sexy."

She laughed. It was a tinkling silvery sound. "Marc Antony thought so." She replaced the bottle and pointed at another. "That one, also Egyptian, much earlier—the morticians rubbed the corpse of the young Pharaoh Tut-ankhamen with it. Balsam, loaded with myrrh."

"And this one?"

"A favorite. We come on up the time scale, to the Battle of Thermopylae. Knowing they were going to fight to the death, the three hundred Spartans perfumed and combed their beards. Citron base, we think. Also good for head lice." We passed on. I pointed to the last bottle. "Caligula bathed in it," she said. "Expensive stuff. Four thousand pounds of rose petals gave him one pound of attar of roses. He had soaked up so much that by the time he was assassinated the undertakers skipped the body wash, or so they say."

That seemed reasonable. "But nowadays all perfumes are synthetics? Like your patent?"

"Yes, mostly. But we try to copy the naturals. A good chemist can come close to nearly anything in nature. That's what I did. I tried to copy a blend of essential oils taken from my own flowers. If my copy proves out, then I'll look for some capital and go commercial. That's where the synthetics come in. Volume production will require barrels of synthetics."

"So how did you get into perfumery in the first place? Why not law . . .or medicine . . . archeology . . . ?"

She shrugged. "It's what I know most about. I have an internal dermal system that uses floral oils to control temperature and to keep my skin pliant." She held up her wrist.

I took a whiff. "Flowers? Very pleasant." We passed on down a hall toward the rear, and into a small one-room apartment. She gave it an illusion of space by what she had done to the walls. They were covered almost from floor to ceiling with good reproductions. She seemed to have all the Mary Cassatts, all versions of "Mother and Child." What minimal space was left over was taken by a few well-known portraits: Renoir's "Girl with Watering Can," Luks's "Boy with Baseball," Reynolds's "Master Hare"; one or two others that I didn't recognize. The only painting that didn't show a child was Vermeer's "The Letter." On the other hand, the lovely Dutch lady was obviously very pregnant.

She pulled me away. "As you can see, I don't need much. Desk, computer, filing cabinet. I use the stove and fridge only when Paul is here. I don't sleep, at least not the way you do. A small closet with a few clothes, suitably in the fashion, all in good taste." She pulled out something on a hanger. "Floral print tank dress with princess seams and flared skirt. Rayon. With double collar polyester jacket, padded shoulders. Quite the thing for early summer. Helps me keep a low profile on the street, or driving. Not that it matters. Everybody

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around here knows about me, but nobody thinks much about it."

I could understand that. The banal everyday human eye probably saw her only as a spirited female personality. I had looked deeper, much deeper, and I had known her body. I thought of Pater's lines about the Mona Lisa: " . . . a beauty wrought out from within upon the flesh, the deposit, little cell by cell, of strange thoughts and fantastic reveries and exquisite passion; . . . She is older than the rocks among which she sits. . ."

At this point I smelled her again. Not just her wrist. And not the potpourri of odors of her lab. *Her*. And this time it wasn't flowers.

Something was going on—something at once fascinating and bewildering. Yesterday, when Paul Machen had brought her into my office, I thought I had detected a wisp of new-mown hay. Last night it had been that aphrodisial musk thing—Cleopatra's come-hither scent. Then, when she had left the office this morning it had been new-mown hay. Again. Was she able, by force of will, to *emit* a preselected scent? Could she change her body odor as she changed her clothes—whatever was appropriate for the occasion? Evidently.

For this present scent was surely Cleopatra's head-swirling blend. Again.

Cleopatra looked up at me.

Marc Antony, I thought, move over.

A week later we cosigned a lease for an apartment near her lab.

A month later her patent application was declared in interference with an application filed by a chap named Kalend.

Amos Kalend. An older man. I had encountered several of his patents when I drafted Juliette's case. He was famous in the field. He had edited the three-volume *Encyclopedia of Perfumes*. (A well-worn set was the centerpiece on Juliette's bookshelves.) But continued exposure to strange scents had deafened his olfactory nerves, and in his fading years he worked purely from theory, like the deaf Beethoven composing the Ninth, without benefit of sensory feedback. Kalend worked for Fleurs, Inc., the big cosmetics manufacturer. Their lawyer was J. Rogan Brewster. I had encountered him a couple of times in the past and didn't especially like him. I'm sure the feeling was mutual. I sensed that it was about to deterioriate further.

I explained interferences to Juliette—two inventors claiming the same invention. The first inventor gets the patent. The Patent Office has to decide who's first. Could be a long fight.

She said, "Joe, maybe we shouldn't fight this. Do I really need the patent?"

"Yeah, you need it. If *they* win, they can shut you down."

"It'll be awfully expensive, won't it?"

"No. A closely related personal matter is involved. I'll do it *gratis*."

She looked at me uneasily. "What are you talking about?"

I handed her the letter. "It came this morning—from the Patent Office Committee on Enrollment. Brewster accuses me of filing a patent application knowing that it was not executed by the true inventor. It's crazy but serious. If I am stricken from the Register of Patent Attorneys I'll probably also be disbarred in D.C. and Maryland."

She looked at me in horror.

I said, "So we have to keep going. The committee will delay my case until we finish with yours, since basically the same issue is involved. They have agreed, if we win the interference, the charges against me will automatically be dropped. And rest assured, you will win."

"But if I *don't* win?"

"You will win."

"Who do they say is our inventor?"

"They don't say. At this point they don't have to say. Later, it may come out they have in mind Paul Machen."

"Paul? Oh for goodness sake, he doesn't know anything about the formula. He doesn't know one odor from another. *You* believe me, don't you Joe?

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That I invented it independently of Paul or anybody?"

"Of course I do."

She sighed without moving her chest. "I guess I brought it on you Joe. Sorry—I didn't realize . . . I had no idea . . . "

I shrugged. Even if she lost the patent, I didn't think I'd be disbarred. Still—it was a blot on my record. My malpractice insurance would probably go up no matter how it came out.

I had been watching her in mixed speculation and admiration. There was this very graceful gesture of arm and hand, when she was explaining something—with the palm left open, as though that clinched the argument. Was that a Julia implant, or was that all her own?

We had a piano in our apartment. I sat on the bench with her and she began playing slowly, softly. Albinoni's great adagio. Mournful, moving. I think to her it explained all the bad things that had ever happened in the world. Her skill was derived from an implant, of course. From Julia? So what? Still marvelous. She said, "So what happens now?"

"There are seven basic stages in an interference. First, the parties file what are called 'Preliminary Statements.' They state under oath their earliest date of invention. Then the parties file motions. That's what Brewster did. He moved to dismiss on the ground you're not the inventor in your patent application. Then discovery, testimony, briefs, final hearing, and the decision. The examiner in charge pushes you along. It'll be over before you know it."

She frowned. "Discovery . . . "

"Brewster has filed a motion to strike your application. He will try to turn up facts to support his motion. We trade documents. They'll probably want to take your deposition, maybe have you examined by experts."

"Can they do that?"

"As a practical matter, yes. If they ask, and we turn them down, they can ask the judge to accept as fact whatever they were aiming at in the deposition."

"Oh." She shifted into Barber's adagio. She didn't like any of this. "Will you be there?"

"Every step of the way."

"Oh, Joe!"

I could see Paul Machen had not prepared her for the trauma of law and lawyers. I tried to reassure her. "Relax! Nothing to it!" I probably made it worse.

"This Brewster fellow, he's pretty mad at you?"

"Well, yes and no. I beat him once, in another interference. We're not exactly friendly, but that's not why he's bringing me up on charges. It's his client—Fleurs. They own the Kalend invention. They're big. They've put a lot of money in their product, and I think they've told Brewster to win at all costs. He's grasping at straws, hoping something will work. Just business."

"I bet he'd do it to you even if you were his own mother."

"Yes, but with tears in his eyes. And enough of Rogie Brewster and patents. It's a beautiful day. Let's get over to the park."

Which we did. She loved to walk in the park. She loved to watch the little idiots running wild on the playground, screaming down the slides, screaming in the swings, screaming on the seesaws. What she saw in all this was a great mystery.

We were strolling hand-in-hand down the central asphalt walk when we encountered a pram with the top down. Juliette asked the young mother if she could look. Okay. She looked in at a pink wriggler. She said something to it and she laughed. It laughed back. As I pulled her away she laughed again and made that funny little gesture with wrist and fist signifying total delight. And I thought at the time, is this Julia, or is this Juliette? And what does it mean? And what difference does it make?

Brewster called me to set up Juliette's deposition. Also, he proposed settle-

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ment. "We compare lab notebooks," he said. "The inventor with the earliest date for the perfume takes the patent and gives the loser a free license. How about it, young man?"

"I'll have to check with my client. I'll get back to you."

I explained it to her. In an interference it's routine for the junior party to suggest settlement. No matter who won, both sides would be free to make and sell the perfume.

The idea had a certain attraction, but I didn't like it. Juliette needed a monopoly. In fact, if Fleurs got the patent they could license any number of perfume makers across the country. I had other reasons, too. Who knows what dates Kalend might have in his notebooks going back before Juliette entered the picture? Also, I was mad at Brewster for bringing those phony charges. Not that that clouded my thinking. Well, maybe a little.

"No," said Juliette. "We need the patent. We fight."

I called Brewster back. He seemed surprised at our decision. I think he expected us to roll over obediently.

And so, holding hands my lady and I waded out into the morass of patent interference litigation. Up to our belly buttons (mine, not hers—she didn't have one). Then our chests, our necks, chins, noses.

We had one encouraging development. In his Preliminary Statement Kalend alleged no date earlier than Juliette's filing date. That meant, under the law, she was *prima facie* the first inventor. She would get the patent if Brewster did nothing. To win the interference Brewster had to win his motion to strike Juliette's patent application. To do that he would have to convince the Final Hearing panel of three examiners-in-chief that Juliette was not the inventor on her own case. And just how did he propose to do that?

His brief for Final Hearing explained all: Juliette was a machine, and hence not qualified to execute a patent.

The way he laid it out, maybe he had a point. To prove he was wrong, we would have to call forth the entire body of science, religion, and philosophy. Juliette bested Hamlet's famous question. For her the question was not, 'Shall I continue to exist?' but 'Do I exist in the first place?'

"Hey, not to worry," I laughingly lied to her.

The day finally came when the depositions were done, the flow of documents had dried up, discovery was over.

The Hearings clerk called me. Final Hearing was set for two weeks.

The old timers in our office claim, if you know who's on the panel, you can predict how the decision will go. They are just bragging, of course. On the other hand, if you add up the scores of the individual panelists (as I did) you can arrive at a probability. We got the news from our spy in the Hearings office. The panel we drew looked like a favorable probability.

There was Timothy Worth. I had gone through law school with his son. Number two was old Ed Brock—a question mark. He had a tendency to nod off during very boring hearings, and I would have to watch him. Number three, and the panel chairman, was Wilson Stretmater. I knew for a fact that he loathed Brewster.

At first I felt good. But then, as I thought about it, I perceived a problem. The problem was Stretmater. For Wilson Stretmater was the living refutation of all probabiliy theories.

I knew the stories. As a lad at camp, in a crowd of taller boys, he was the only one struck by lightning. Long recovered, but there it was. Five years ago he had been picked in a random IRS audit. And not yet recovered. Then the flu shot—was one of the two hit by the Guillain-Barre syndrome, out of fifty million shots. He still walked with a cane.

The Hearing was scheduled for the af-

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ternoon. Late that morning our friend at the clerk's office called. Stretmater was in the hospital with an emergency appendectomy. Well, there it was. Poor Stretmater; poor us.

Dr. Preston would take his place. Dr. Mary Preston. The youngest, smartest, most ambitious, and at the moment known to be the most pregnant of the corps of examiners. Preston, the strict constructionist. The dotter of *i*'s, the crosser of *t*'s. Preston the sure, the unerring, the invincible. No panel in which she had participated had ever been reversed on appeal.

The phone rattled as I replaced it.

Juliette was there, listening. "Mary Preston. Well, well. Probably her last case before maternity leave."

To escape curious spectators and also to go over some notes, Juliette and I had ducked into one of the witness alcoves a adjoining the hearing rooms. We had been there five minutes when Brewster burst in. "Ah, thought I might find you here! Good news, friends, *very* good news!"

I doubted it. We waited.

"Fleurs is willing to buy your patent!"

"We are touched, Rogie," Juliette said. "How much?"

He studied us with small radiant eyes. "Twen-ty-five thou." He broke it down into slow syllables.

She laughed quietly.

He looked puzzled. "Thirty . . . ? *Fifty* . . . ?"

She shook her head.

"We'll get the patent, you know," he said almost plaintively. "And no matter how you grovel and beg, we'll shut you down."

A silence.

"How much?" he said mournfully.

"Five million," Juliette said.

He drew back, red-faced. His voice trembled. "You'll be sorry. Both of you." He sniffed. So did I. Juliette just smiled. I sensed the sharp odor of brimstone. She was exuding it, of course. "What's that?" he gasped.

I gave him a very sympathetic look and put a handkerchief over my nose. "I think she's telling you to go to hell."

He backed away. His face was livid. "You're both insane. All right. You give me no choice. I'm going in there and I'm going to tear her to pieces." He slammed the door behind him.

I looked at my watch. "Court time. You don't want to be late for your dismemberment."

We took our places at the senior table and looked around. Amos Kalend looked at us from the junior table and smiled genially. We smiled back. Brewster gave no sign he knew we existed. Behind the bar the audience packed the chamber, which was much too small for this kind of thing. An equal number waited outside in the hall, and they took turns looking through the glass panes in the doors.

The three panelists filed into the hearing room through a side door, and we all stood. Dr. Preston gave us a generic smile and rather carefully took her seat behind her desk. She looked *big*. If she had suddenly stood up again and cried out "It's started!" I wouldn't have been surprised. With her extra pounds she seemed vaguely clumsy. And yet, despite all, she was an attractive woman. Her first child, according to rumor. She glanced once at Juliette, then deliberately turned away. Her male colleagues were more open, almost to the point of rudeness. Brock looked at Juliette, then looked away, adjusted his glasses, and looked again. Tim Worth gave one long look, sighed, then with what seemed a deliberate effort of will, shifted his eyes to me. He managed a sort of smile, very noncommittal. Brock was our strip of litmus—the one to watch. He had the shortest attention span. We needed him, and I had to keep him awake and alert.

Dr. Preston tapped her desk a couple of times with her pencil. The audience behind the bar quickly quieted down, and she began dictating in measured

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tones to the court reporter. "These proceedings are held pursuant to 37 C.F.R. 1.654. This is the Final Hearing in Patent Interference Number 117/2025 to determine priority between Kalend, Junior Party, and Juliette, Senior Party. There is one interference count. The invention claimed is a composition of matter, a perfume." She looked across her bench and seemed to study the lawyers quizzically. Her eyes never returned to Juliette. Deliberately, I thought. I had a fair idea what was going through her head: this would probably be the strangest case in her career, but she would give no hint that it was anything out of the ordinary. Everything would be by the book. She said quietly, "Representations?"

My opposite number stood at the junior party table. "Good morning, Your Honor." The voice was faintly rasping, totally confident. "J. Rogan Brewster for the party Kalend." Leisurely, he sat down again, then leaned back a little, as though to say, I've already won. Why go through with this? I envied him his ability to strut sitting down.

My turn. I pushed my chair back and stood. "Joseph Kemp, for the party Juliette." I think hardly anybody in the audience saw me. Most everybody was still looking at Juliette. She was dressed in simple gray skirt and matching ivory jacket. She wore no makeup, no jewelry. She turned in a fluid graceful motion and smiled up at me as I sat down. The gesture seemed to spark a muted susurrus behind us.

Dr. Preston chose her words carefully. "We are pleased to note that both sides are represented by competent counsel. We expect that everything relevant to priority will be brought to light. Since the Party Juliette filed first, the burden of proof of priority is, of course, on the Party Kalend." She studied the file in front of her. "Kalend has filed a motion to strike the Juliette application for failure to name the true inventor. The Party Juliette has opposed the motion. Procedure has been modified to permit oral testimony relevant to the motion. Since the motion is the only issue, our decision on the motion will be dispositive of the interference." She looked toward the junior table. "Do you have an opening statement, Mr. Brewster?"

He stood. "I do, your honor. Our position is simple. Section 102 of the patent statute states, 'A *person* shall be entitled to a patent . . .' and so on. Section 111 states, 'Application for patent shall be made . . . by the *inventor* . . . ' My emphasis, Your Honor." He turned toward my table and stared sternly at Juliette. Then back to the dais. "Your Honors, it's not really clear what Ms. Juliette is. A robot? A mechanical woman? An ambulatory computer? Whatever she is, she is *not* a *person*. And since she is not a person, then it follows that, under our laws she . . . or it . . . cannot execute a petition for a patent."

He paused, pivoted again toward our table, frowned, shrank back a little, as though offended and puzzled by our presence. "This 'person' requirement is not a whimsical triviality of statutory drafting. No indeed. Your Honors, it flows naturally from our laws, which require that in case of conflict, and no matter who filed first, it's the first inventor that gets the patent. The case before this honorable panel is a perfect example of why 'person' is stated in Section 102. To prove dates, depositions of *people* are taken. Statements are made under oath by *people*. A machine cannot swear to anything. Our traditional oath requires a belief in God and a belief that God will punish a lie—concepts that surely have no application to a soulless machine."

He took a long, deep breath, folded his arms over his chest, glanced contemptuously at Juliette and me, then back to the panel. "And aside from that, Your Honors, a computer cannot of itself invent. If there is an invention, the inventor is the programmer. Under our laws the true and actual inventor must be named in the patent application, else

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the patent is invalid. The person or persons who created Ms. Juliette should have been named in the Juliette application, and they should have signed and made oath or affirmed that *they* were the true inventor or inventors."

He sighed, shook his head, almost in sorrow, as though deeply regretting that so honorable a panel should have to waste its valuable time with such a ridiculous case. He took a few breaths, poured a glass of water from a carafe. "Is Ms. Juliette a person, or is she a machine? Or a . . . what?" After a few sips he replaced the glass and held up a document. "As I shall show, she herself provides the answer. And that completes my opening statement." He sat down.

"Mr. Kemp, any opening?"

"I'd like to combine with rebuttal."

"Of course. Mr. Brewster, are you offering testimony?"

"Yes, your honor. During routine discovery we deposed the entity known here as Ms. Juliette. I call Ms. Juliette to the stand."

The court reporter, after a very brief hesitation, swore her in and Brewster continued. "I will now read into the record portions of her deposition."

Question: What is your name?

Answer: Juliette.

Question: Who named you?

Answer: Paul. Dr. Paul Machen.

Question: He made you?

Answer: Yes. In his laboratory.

Question: You were, shall we say, *born* six years ago?

Answer: Yes.

Question: Do you know how Dr. Machen made you? The process?

Answer: Probably not everything. But I can tell you what I remember, and what he told me.

Question: Go ahead.

Answer: My first memory—four technicians standing by, ready to override if the computer faltered. But no one expected any problems. Paul himself had programmed the assembly procedure. It was quite intricate. The men were watching the screen panel intently. There were six screens in the panel: they provided views of me on four sides, plus top and bottom. I sat on a glass-enclosed operating chair and I was covered by a sterile bib. The assembly shown by the six screens was what, in a human being, would be part of a brain, more specifically, the hippocampus, so named because in section the little organ looks like an upside-down seahorse, the Greek word for which is hippocampus. Sensations that come to us through our five senses are processsed in the hippocampus, then categorized and refiled in other parts of the brain. Visuals go to the temporal lobe, location and movement to the parietal lobe, sounds and smells to other lobes. That's how we sum up our lives. But *I* had no prior life, at least not as myself. What I had was cerebral implants—over three thousand, encapsulating hundreds of thousands of data banks, and involving every known aspect of humanity, including the recapitulation of biologic history from the first tentative cellular life right up to *Homo sapiens*.

Question: Implants? Can you describe some of these?

Answer: Some were for motor skills. Some would teach me how to walk . . . and walk like a lady, with a certain hauteur, if that's what I wanted. Some taught me how to talk, like a woman of culture, and in various foreign languages. Various behaviors were . . . optional. Some would give me street smarts . . . a mocking good nature, a bohemian camaraderie. Some were for laughter, some for song. I would be able to sing anything, any mode. The classic arias, the street gassers. Some were biographic summaries . . . saints, sinners, men, women, doctors, scientists, artists, writers.

Question: Any . . . women . . . "

Attorney Brewster stopped in midsentence and looked over at the reporter.

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"No . . . strike that."

Juliette's soft laughter interrupted him. "Oh, finish it, Rogie. Your question was, 'Any women of the street?' And I answered, 'One for every lawyer.'"

Brewster cleared his throat. "Well then, you do recall my questions, and those were your answers, under oath, and have you any changes to make in your testimony?"

"Yes, Mr. Brewster, those were your questions, and those were my answers, under oath, and no, I have no changes to make in my testimony."

"Oh, one more thing. You neither eat nor drink?"

"Not in the sense you mean. My metabolism is based on a renewable nuclear pellet. Also, from time to time I must renew my stores of several different essential oils, which I need for temperature control and as skin conditioners. That feature is not part of an autonomic system. I have full mental control."

Brewster sniffed. "And you can use it for different body perfumes?"

"Of course." She held up a wrist. "Daffodil."

The lawyer coughed and backed away. "Nothing further."

I got up. I gave each of the panelists a fleeting grin. "Your Honors, let me pause a moment to compliment learned counsel. Before our very eyes Mr. Brewster has created what may be the most marvelous paradox in legal history. He has taken testimony under oath from what he calls a nonperson to prove that a nonperson cannot give testimony under oath." I bowed deeply, humbly toward the junior table.

Brewster got up, sputtering. "Your Honors! Objection! Make him stop that!"

Dr. Preston's expression was hard to decipher. "Sustained. Mr. Kemp, you're wasting valuable time."

"I apologize, your Honors."

Brewster, red-faced, shook his head but sat down again.

I said, "Ms. Juliette, are you registered to vote?"

"I am."

"Do you have a driver's license?"

"Yes, sir."

"You are a member of your local Presbyterian church?"

"I am. And a member of the choir. I'm a fairly good soprano."

"You signed a lease for your shop?"

"Yes, as Juliette."

"And you're in the phone directory as Juliette?"

"Yes."

"Thank you, ma'am." I looked over at the junior table. "Redirect, Mr. Brewster?"

He hesitated. I saw his problem. More examination of a nonperson . . . under oath? Maybe that wouldn't be such a good idea. "Nothing," he mumbled.

Juliette was getting up from the witness chair, ready to rejoin me at our table, when Dr. Preston spoke up. "Ms. Juliette, one moment. Are we to understand from your testimony that you can control your body odor, both composition and quantity, at will?"

"Pretty much, your Honor."

"And today, during this hearing, from time to time, you emitted a certain . . . odor?"

"Yes."

Oh, God! I thought. Not the Cleopatra special!

"Did Mr. Kemp recommend that you do this?"

"No, madame. It was entirely my idea."

"Is that true, Mr. Kemp?"

I sniffed. I didn't smell anything. "Dr. Preston, I haven't the faintest idea . . . what you're talking about."

That seemed to satisfy her. She smiled faintly. "That's all, Ms. Juliette. You may step down."

Brewster struck his table with his fist. "Now wait a minute! What's going on here? I demand to know!"

The lady panelist scowled at him. "Control yourself, Mr. Brewster. Noth-

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ing's going on. Do you have any other witnesses on this motion?"

He blinked. "One more, your honor. I call Mr. Harry Reinman."

The new witness was duly sworn in.

Brewster continued. "What is your occupation, Mr. Reinman?"

"I'm manager, Washington office, Personnel, Inc. We conduct various tests on personnel sent to us by our clients."

"You tested Ms. Juliette at our request and with her consent?"

"Yes sir."

"What kinds of tests?"

"We started with IQ."

"What was her IQ?"

"One hundred ninety-five."

"Way up there! Is IQ a test for humanness?"

"Certainly not, Mr. Brewster. Nor is gender, nor morality, nor age, or mental or physical skills. These things do not make her human. They simply attest to the remarkable programming skills of her creators. She is still a machine—an ambulatory computer."

"You made other tests?"

"Yes, tests for stress . . . sexual orientation . . . leadership potential . . . personality analyses. We use various tools—voice, polygraph . . . K-E . . . "

"K-E? Kohlen-Emmerich? That's where you show the subject a specific motion holo for a few seconds, then measure his—her—reaction?"

"Yes, sir."

"For a given holo, there's a normal reaction?"

"Well, Mr. Brewster, actually there's a normal reaction *range*. We get a bell curve, based on several hundred thousand tests. The peak is the average, but we get a cases on both tails of the curve, either 'hypo' meaning little or no response, or on the other side, 'hyper'—an extremely high response."

"Can you give us an example? For instance, how would you test for fear?"

"We have various programs for fear, depending on the subject's predetermined susceptibilities. A good one is a simul of the subject tied to railroad tracks, with the express coming, full audio. Some respond better to a charging predator...a tiger is good."

"So these tests are actually aimed at evaluating emotions?"

"Basically, yes."

"How many emotions are in your K-E portfoio?"

"At the moment, about fifty."

"Now, Mr. Reinman, did there come a time when you tested Ms. Juliette by the K-E techniques?"

"Yes, sir."

"Which tests?"

The witness referred to notes. "Well, with her we used the core twelve standard emotions: fear, happiness, rage, awe, hate, sadness, nostalgia, jealousy, love, tolerance, compassion, and loyalty."

"With what result?"

"She was in the normal range for fear. But for rage, hate, nostalgia, jealousy, all hypo—far below normal. And for happiness, awe, love, tolerance, compassion and loyalty, all hyper, all far above normal."

"And from this, you concluded . . . ?"

"She had an abnormal personality."

"Would you go so far as to say, subhuman?"

"Subhuman, yes."

"She is seriously flawed?"

"Yes, very seriously flawed."

Brewster turned to the senior table with his most beatific smile. "Cross?"

I returned the smile. "Yes. Mr. Reinman, you said, 'very seriously flawed.' Please explain."

"Yes, sir. Our tests showed that she was deficient in certain character traits that have helped humans and other primates to survive over the past few million years . . . the ability to be cruel, unforgiving, revengeful, to maim, kill, destroy life, limb, property, as occasion may indicate."

"She lacks these traits?"

"In spades."

"We're offering your full report in evi-

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dence, Mr. Reinman. Meanwhile, I note that in Section Nine, pages 162-280, you had occasion to apply the K-E tests posthumously to certain persons."

"Yes, sir, a few. Experimental and hypothetical, of course, all based on their bio histories."

"Women?"

The witness looked over at Brewster, who appeared to be busy doodling on a legal pad.

I said softly. "Women, Mr. Reinman?"

The witness sighed. "Several women."

"Eleanor Roosevelt?"

"I think she was one."

"You found she was deficient in the several of the traits needed for primate survival? She was devoid of cruelty, and so on? In a word, she lacked human faults?"

"I . . . guess so."

"And lacking those traits, you judged her to be a flawed as a person?"

"Well . . . maybe a little."

"And Florence Nightingale . . . Susan B. Anthony . . . Marie Curie . . . Mother Teresa . . . all flawed?"

Reinman groaned softly. "It isn't what you think, Mr. Kemp. You're getting it all twisted."

I grinned. "Nothing further."

Brewster grumped, "No redirect."

Dr. Preston said, "The witness is excused, and I believe that completes testimony. Mr. Brewster, do you wish to make a closing statement? Mr. Brewster?"

"Closing . . . ? Oh, yes, of course." He began. "Many foreign countries determine priority of invention by the time of filing the patent application. First to file gets the patent. In our country, the *person* first to invent gets the patent. So we must ask, is the entity Juliette a person? By her own description—no. By simple logic—no. By the obvious intent of the drafters of our patent statutes—no. They surely contemplated a real human being—which *she* just as surely is not. She makes no pretense of normal human emotions; such things cannot be implanted with silicon chips. They can be achieved only with the passage of time, like the growth of tree rings. Indeed, we have heard expert testimony as to her emotional vacuum. Sad, really. She has no soul. She is psychically and physically sterile. She can never fall in love with a man, nor a man with her."

He paused. Juliette kicked me under the table. I was tempted to kick back, but by exercise of tremendous willpower, didn't. Brewster continued.

"If this motion is denied we'll soon see patent applications filed by microwave ovens, washing machines, alarm clocks, lawn mowers . . . it . . . it's preposterous. That's all. The motion should be granted. Thank you." He sat down.

I rose, bowed slightly to the junior table, then to the panel. I noted that Ed Brock seemed awake but bored. "I am touched by counsel's concern for my client's emotional life. Sad? He impeaches his own witness, who found Ms. Juliette to be happy and cheerful. But let it pass.

"Mr. Brewster says my client is a machine, not a person. Well now, what *is* a machine?" I held up a thick book. "Webster says: '*Machine*—an assemblage of parts that transmits forces, motion, and energy to one another in a predetermined manner.' Can we think of a better definition for a human being? Does the Patent Office demand that the inventor be a human being? No. The 'Declaration' form used by the Patent Office, and which the inventor must sign, does not use the word 'person.' It simply says, 'inventor.' Nor does the form require him or her to swear to anything. The inventor simply 'declares' that certain things are true to the best of his or her knowledge.

"Does a 'person' have to be a member *Homo sapiens*? I think not. The Christian religion speaks of 'God in three persons'—two of which are certainly nonhuman. In a famous design patent case

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for a finger-painting, the Patent Office accepted a chimpanzee as the inventor. In a little-known case where the inventor had a triple personality, the Office accepted all three personalities as joint inventors."

Brock appeared to be staring fixedly at the file on his desk. This was not good. I hurried along. "Mr. Brewster says that only the people who created my client should have been named as inventors. That's Dr. Machen and several technicians. That's silly. None of them, singly or as a group, can describe the invention. They cannot tell you how to make the perfume. They would perjure themselves if they swore they made this invention."

Brock's eyes were definitely glazing. I continued. "Ms. Juliette is intelligent, creative, inventive, a pillar of her community. She owns and operates her own laboratory and her own perfume shop. She pays taxes—federal, state, local. Mr. Brewster claims she has no soul. We think he is not an expert on the subject. Probably none of us is. Did Hitler have a soul? Attila? Gilles de Retz? She is certainly more human than they.

"Let each of us look into his own mind. What do we see? Something really quite astonishing—a wild collection of electrical circuits and switches. Yes, that wet spongy mass of neurons is *us* —our I.D.—our consciousness of self. Granted, our mind evolved over millions of years, willy nilly, helter-skelter. Juliette's evolved on the drafting board over a few months, in the mind of a genius. But the only difference in hers and ours is: hers is metal, ours is organic."

Brock's eyes had closed. Maybe I should quit right there. But no. I needed to get one more thing in the record. "A curious point. The word 'person' derives through Old French, from Latin, and before that, from Etruscan. Their word was 'phersu,' which meant 'mask,' such as would be worn by an actor in a play. The meaning resurfaces here in our modern AI technology. The body of Ms. Juliette—a remarkable achievement all by itself—is a mask for something even greater—an identity differing from the human norm only in matters of decency and virtue. True, she is deficient in certain of the baser elements that help define human nature. We concede, to this extent, she is flawed. We applaud the flaw."

In a moment Brock would nod, and the consequences would be unpredictable. Brewster might even insist on a rehearing with a different panel. But the semi-somnolent panelist was about to get a wake-up call. My voice rose half an octave. "Suppose, in response to Mr. Brewster's insults, Ms. Juliette picks up this water carafe —" and here I picked it up with both hands—"and *throws it at him.*"

I made half a motion, then stopped. Ed Brock jerked. His mouth and eyes were suddenly wide open. Brewster looked up in alarm, then ducked.

I laughed and replaced the carafe. "Would learned counsel howl 'assault and battery'? Of course he would! Look at him!"

Dr. Preston gave her desk an angry slap. "Mis-ter Kemp!"

"Sorry, your Honor. I apologize. But think about it! Can a mere machine commit assault and battery? Can the police arrest a machine? Can the judicial system imprison a machine? Fear not! Ms. Juliette is indeed subject to our laws—as a person. And she should have the benefit of our laws—as a person. For she *is* a person. The motion should be denied. Thank you, your honors." I bowed to the panel and took my seat.

Juliette squeezed my arm and whispered, "A-plus!"

Dr. Preston said, "Both counsel have made some very cogent arguments. If a bit irregular." She took a deep breath and seemed to stare for a long moment at the pen set on the top of her desk. Finally she said, "Thank you, gentlemen. There being nothing further, the case is closed. You will have our decision in

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due course." She arose and left, followed by Brock and Worth. Tim Worth looked back at me and shrugged eloquently. Don't ask *me*, he was saying.

I asked Juliette, right then and there. "What was that all about—that bit about odor?"

"A girl thing," she explained. She seemed pensive. I gave up.

According to the Manual of Patent Examining Procedure—the sacred two-thousand-page MPEP, the Bible, Torah, Koran and spinal column of the Patent Office—the Board of Interference Examiners aims at handing down its decision within two months of the Final Hearing. Actually the decision is often available in two weeks. A month is rare. They took their sweet time on this one. I could visualize them batting it back and forth, changing their minds, arguing, maybe even inviting comments by the Commissioner, though it was strictly outside his statutory responsibilities.

It was released officially on the seventy-fifth day. We received a fax that morning. As panelist chairperson Mary Preston had written the opinion, and she quoted a lot of Brewster. This was not reassuring. I read on:

"We come now to a crucial matter, one to which we gave great weight in making our decision.

"On several occasions Ms. Juliette appeared to 'emit' (we lack a better word) several waves of what might be considered a special body odor or perfume'—perceptible to the discriminating nostril as a blend of baby talcum, soap, faint wisps of soiled diapers . . . the kind of scents one might find in a nursery. She was able to do this because of some remarkable dermal engineering by her creator, Dr. Paul Machen. Ms. Juliette surely knew Examiner Preston was pregnant, and Ms. Juliette might well have intended the odor as a subliminal appeal to Examiner Preston's subconscious. If that was the case (and we do not say that it was), Examiner Preston was not deceived, but she was not offended, either, at least so long as it was Ms. Juliette's own idea, and we have her sworn statement that it was."

(Right there I stopped. Very suddenly I saw it all: the one thing that Juliette really wanted, the one thing she could never have. My lips moved as I finished the text.)

"We view the scent-drama as a greeting from the heart, a *crie de coeur,* from one woman to another—*a thing impossible for a machine.*

"For the purposes of 35 U.S.C. 102 Ms. Juliette is a person.

"The Motion of the Party Kalend is DENIED."■

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BIOLOG Jay Kay Klein

Rajnar Vajra

Who would want to know about me? Rajnar Vajra pretty well repeats the astonishment of most *Analog* authors. The magazine is seventy years old, but its writers nearly all feel they're just starting their careers. And yet, they've all been through years of intensive formal or even more vigorous self-directed science-centered education. This has been well mixed with a bemused overview of the haphazard political and social engineering that has landed them in a chaotic civilization that doesn't really make any sense.

Following Roger Penrose's reasoning in *The Emperor's New Mind*, you reach a point where he admits his scientific explication must seem like mystic nonsense. Rajnar came to this conclusion about the universe somewhere around the age of seven. Crammed with math and tangled up with string theory, at age twenty he decided he needed a break from externalities and had to get to know his inner self. He borrowed a trick employed by contemplative orders and changed his name—a sort of rebirth as someone else. By a series of asymptotic approximations, he hit on Rajnar, suggested by his first meditative discipline of Raja Yoga, and the Sanskrit word for "third eye," *ajna*.

Thus equipped for contemplating his navel in the five dimensions required by string theory, he headed for his rendezvous with *Analog* a generation later by immersing himself in music, astronomy, art, and gemology. His writing would ultimately encompass mystery, poetry, fantasy, and songs. His various bread-and-butter occupations include musician, music teacher, jeweler, recording engineer, and MIDI consultant. He performed the sort of Drunkard's Walk made famous in SF by Fred Pohl that so often leads to a metier of authorship. Talent, intelligence, education, imagination, and experience eventuate in the formation of a writer. It took fifty years of living to get him to the point of considering himself a beginning writer.

Born in New York City, he was transplanted to San Diego at age seven. In elementary school, he immersed himself in the imaginative literature of fantasy, best exemplified by *The Hobbit*. He learned to play the piano, and started to write poetry. In middle school, his mother introduced him to *Analog* author Clifford Simak's *Time Is the Simplest Thing*. The fantasy ideas and scientific visions were dazzling to an expanding mind. *Analog*, with Harry Harrison's *Deathworld*, came along a few weeks later, and Rajnar-to-be became a science-fiction junkie.

Success at eating from the proceeds of painting in oils and acrylics, audio recording, selling for a hi-fi boutique, then owning a musical instrument store, teaching keyboard, guitar, and bass (he was lead guitarist for ten years in a Bay Area rock band) suddenly palled when he realized he had better get started on his long-anticipated writing career before he turned fifty. He was a bit rusty since his grade-school writing days when he garnered childish triumphs and awards for writing. He embarked on a massive novel with vast and staggering ideas, in a plot worthy of a galaxy-spanning opus.

Working out the mental stiffness on a

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first draft for a year, he felt he was also ready to tackle short stories. Stan Schmidt was encouraging and helpful. A friend bought a couple of stories, but success came just about in time for his fiftieth birthday with a sale to *Analog* (July/Aug, 1999).

Rajnar feels that SF can have the same human interaction qualities found in the best literature but too often skimped by some SF writers who are gimmick and plot-driven. SF itself is the only literature that illuminates the way ahead for our otherwise blind and unheeding population. SF can contrast folly with the benefits of hypothecating man's technical achievements into a compounded glorious future. *Analog* has been doing this in a conscious way since the editorship of John Campbell that started ten years before Rajnar was born.

Analog having reached the biblical age of threescore and ten for a human lifespan this past January, Stan Schmidt threw a birthday party in New York. With twenty-one years as its fifth editor, he is primus inter pares among those who contribute to the magazine's immortality. In this span, the science has become increasingly complex and literary standards ever higher. Extremely young beginning writers at one time could write stories good enough to publish. Ken Sterling started at a wonderful age fifteen and Charles Cloukey at an amazing twelve. Rajnar has outgrown childish things after a lifelong search for pure understanding of the inner self and its relation to the external universe. The result of this coming of age now appears in the Millennial *Analog*.

Continued from page 8

There are, of course, employers who've been very good about this all along, and individuals within virtually any organization who would like to be but can't. Particularly in large companies, direct supervisors—individuals in middle management—may have the best of intentions but be prevented from implementing them by *their* bosses (which, of course, stresses *them*).

Maybe a good principle for the guidance of managers at *all* levels would be to ask themselves, about every decision they must make, whether of general policy or specific action: "How would *I* feel about being subjected to this?"

Sound familiar?

Correction:

The third place novelette in our AnLab Readers Award Poll, "Emperor Penguins," was written by Joseph Manzione.

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His Hands Passed Like Clouds

Rajnar Vajra

Illustration by Beryl Bush

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Can you imagine working on a strange and complex jigsaw puzzle where the pieces don't fit into any logical pattern because a single, crucial piece is missing? Welcome to my life. And, if you aren't immune to the weird, I have a suggestion: brace yourself!

I'd better start by telling you about Uncle Joe, the Cloudman.

As far back as I can remember, he was a neighborhood fixture, relentlessly painting his sky-landscapes down at Beck's Beach, only two and a half blocks from the old yellow house I grew up in.

I used the word "fixture" deliberately. You would think that Joe must have sneaked off now and then to buy his next canvas or sleep or use a bathroom or cash a check; but I never, ever, caught him AWOL (which in his case would have meant AWay from Ocean Lair). For the life of me, I can't visualize our beach without the Cloudman. It's easier, honestly, to picture it without the Atlantic.

Everyone in our small community pitched in, making sure Joe had plenty to eat and drink, not that he asked for much. He was never sick, he never appeared unhappy or uncomfortable, and he never complained about anything. His chief—in fact, his only problem in life seemed to be weather that was either too bad or too good for his one fixed purpose.

Starting when I was six years old, if the summer mornings looked even slightly encouraging, Ma would send me trotting down to the seashore with a huge canvas tote slung over my right shoulder. That is, I'd start out trotting. My burden would soon wear me down until I finally needed to sit on the sidewalk and rest every few yards.

Just *thinking* about that tote makes my shoulder ache, even after all these years! My brother, who went to a summer school for "gifted" children and was allergic to carrying stuff, once called it "Atlas's Sack" (I don't mind supporting the world, folks, but someone get this damn *sack* off me!). It typically contained four peanut butter and jelly sandwiches (Joe could eat and paint at the same time), two bananas, a dozen carrot sticks, a big thermos of disgustingly diluted Juicy Juice, paper cups, a Tupperware jar of filtered water for the Cloudman's atomizer, and four oranges.

If all that wasn't enough weight for a semi-handicapped youngster, the inevitable bottle of sunscreen lurked beneath the sandwiches, cocooned in what Ma considered the ultimate barrier: Reynolds Wrap.

Now, I'd better stop and tell you about the bane of my early childhood. I was born with a deformed left hand. At first, my doctors were convinced it was Dupuytren's contracture: a rare condition where excess collagen inside the hand binds its joints into clenched uselessness. When the usual treatment (injections of collagenase and other collagen dissolving enzymes) did exactly nothing, the doctors could only scratch their heads. But they wanted to perform a series of experimental operations anyway. My parents flat-out refused.

I only learned of this refusal years later when my brother, Tim, who is five years my senior and selfish enough to have the brains *and* the looks in our family, told me about it. I couldn't imagine why my parents wouldn't agree to surgery but Tim had a theory. He claimed that Mom and Dad didn't give a damn about my big defect (they really did seem strangely unconcerned). He said they were only willing for me to get treatment as long as they thought I had Dupuytren's because both Ronald Reagan and Margaret Thatcher suffered from the condition, and Dad especially would have hated it if I'd grown up to be an "asshole conservative politician."

I didn't believe my big brother, not much anyway, but I didn't understand why someone hadn't tried to do *something*.

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I hated my crippled hand with all my heart.

My friends, naturally, hadn't helped. They'd dubbed it "The Claw" because of how it was all scrunched up. Our old family physician once told me in private that I wasn't, as I thought, uniquely cursed. He'd seen a case or two like mine before and he wanted me to know it was strictly a "hereditary condition." I had no idea what he was talking about; no one else in my family was crippled in any way.

And it sure would have been easier to carry Atlas's Sack down to Beck's Beach with two functional hands.

"Good morning, young Gregory," the Cloudman would always announce when I got within twenty feet of his easel, even when I crept up from behind. "I trust that today's glorious sun will reflect off your best behavior?"

"I'll try real hard, Uncle Joe," I'd always respond, lying through my baby teeth.

The "Uncle" was honorary but absolutely earned. An understanding had crystallized between this eccentric painter and the local parents that he would act as an unofficial day care provider in exchange for meals and resident privileges. Trust me, our parents got the best of *that* bargain.

But I always wondered how on Earth such an understanding ever got started. When I called the painter "eccentric," I meant it.

Just to give you an inkling: the man spent every day, even in the worst winter weather, in the company of the Atlantic Ocean, and he never painted a single wave, sailboat, or seagull. Just clouds. As long as he could see clouds he'd paint them; his favorite were the cumulous variety but he'd stoop to stratus or cirrus in a pinch. A big, clear plastic tarp was Joe's answer to rain or snow. On foggy days, not commonplace on Cape Cod, he'd just stand there and patiently study the bland sky.

* * *

I have to admit that Joe was one ugly old cuss. He had a sun-dried tomato of a face and his eyes were undeniably scary. Even my dad, Mr. You-Think-This-Is-Bad-I've-Seen-Worse, once confessed (under pressure) that he couldn't remember a fiercer case of cataracts. Joe's corneas were so thickly encrusted, it seemed impossible for him to perceive anything smaller than an ocean liner, let alone wield a liner *brush*. Not to mention keep an eye on brats like I used to be.

Yet he did every task with ease and grace. He watched over us like a faithful hawk and somehow the quality of his art never suffered.

Joe was even a *commercial* success. His paintings sold faster than fresh crab cakes, usually to Martha's Vineyard gallery owners who, like mercantile mountains, were forced to come to him. Sometimes tourists who were too savvy or insensitive to be discouraged by the "Residents Only" signs would drift over our pathetic few square yards of hauled-in sand (which had to be replaced after big storms) and watch Joe working. Most would soon haul out cash or checks, even while the fast-drying acrylics were still tacky, and to their own astonishment, hand over whatever the Cloudman required without one syllable of bargaining.

That part, at least, I thought I understood. Joe's artwork was exquisite. His painted clouds appeared swollen with an almost . . . religious light, and they evoked strong and peculiar feelings that you could *almost* name. The Cloudman's big secret, or so he claimed, was all in the under-painting.

Even discounting the cataracts, it was a mystery how Joe managed to keep track of as many as seven kids without turning his face away from sky, paints, or canvas. Ears like Superman (and a bladder to match) was the consensus. If any of us got overly obnoxious, or took one step past the shallowest waters, that

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incredible voice of his would come after us like a charging bull.

"GREGORY. COME HERE AT ONCE."

I've never heard anyone else with pipes like his. His voice was suitable for one of the Seraphim or at the very least, a Galactic Emperor—deep, powerful, and so resonant that if you closed your eyes and listened to Joe, you couldn't tell if he was standing directly in front of you or behind. And his inflection could be *commanding*. Oh yes! No kid ever ignored or disobeyed the Cloudman when he was issuing direct orders.

And if someone *really* screwed up, they'd have to stand right beside the bizarre old geezer and hold his free hand for awhile as if crossing a dangerous street. Most of us found this experience to be downright sickening. Not because Joe smelled bad as you might expect from someone so old and who never seemed to take a shower or brush his teeth (the Cloudman always smelled faintly of fresh bread). But the man had ghastly hands, which felt like skin stuffed with unshelled walnuts.

It was different for me. Way different. When *I* screwed up, Joe always insisted on holding my *left* hand, the crippled one.

I'd stand to his right and he'd simply transfer his brush to his left hand and keep painting. It didn't seem to slow him down but I couldn't figure out why he never held my good hand. If he didn't want me on his left side for some reason he could have held my right hand while making me face the opposite way.

The first time I misbehaved, I found the consequences excruciatingly creepy although I was numb to the texture of his grip. But then, after a few minutes, my bad hand began to tingle and feel as if warm water was flowing through it. In those early days, it seldom felt anything, let alone *warm*. And when Joe finally let go, I could actually wiggle my useless fingers a whole sixteenth of an inch!

After that, of course, I was the perfect Problem Child at least once a day. I had no idea why, but the Claw kept improving . . .

I seldom thought about Uncle Joe after I went to New York City in 1992 to study at Pratt. That same fall, my parents moved to Connecticut ostensibly to be closer to my brother, Tim, and his newly pregnant wife, Dana, but really to lie in wait for their grandchild. So when I went home for school breaks, it was to an unfamiliar home.

Joe seemed distant and irrelevant when I finally got my first real job with a big ad agency in Manhattan. Maybe I didn't want to think about him; he just didn't fit into a world I understood. In the ten years it took me to work my way up to Graphics and Art Director, I only remembered the Cloudman when I was telling someone how I first got interested in art or on the rare days my left hand felt a bit cramped.

But you can't truly forget anyone who *shaped* you.

January 3, 2008, was the worst day of my life. The day of the car crash. I won't sicken you (or myself) by recounting the grosser details, but I was taking a cab to my office and my driver tried to beat out one red light too many. The driver wound up with a fatal injury you don't want to know is even possible, and I wound up pinned in a crushed taxi for two eternal hours.

According to my doctors and common sense, I should have died on the spot. Instead, I landed in Mount Sinai with real damages: legs whose bones had become 3D jigsaw puzzles, four badly broken ribs, and a collapsed lung. Also, internal bleeding so serious that my parents and my busy brother had to drive down from New England posthaste in the faint hope there would be a chance to say goodbye.

For several days, doctors were especially interested in my case because my first tests revealed the presence of some rather exotic bacteria floating around in

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my bloodstream. But when later tests showed my blood to be normal, everyone assumed the earlier evidence had been the result of a lab mistake, contamination of some obscure kind.

I didn't die, but it took some time before I was grateful about that. If you don't already know, I pray you never learn how much the human body can *hurt.*

After five operations, two months of recovery, and six months of physical therapy that Torquemada might have felt squeamish about, I was hobbling around like a hundred-year-old man in terrible shape for his age.

Don't get me wrong: hobbling was an *achievement.* I was thrilled to hobble. Initially, my prognosis hadn't included standing, let alone walking. But, despite New York's apparently sincere efforts to make life a joy for the . . . physically challenged, the city was no place for me until and unless I regained mobility. Or developed the attitude and altitude of a high-grade saint.

My brother, bless his heart, suggested I return to the old yellow house on the Cape and get some hired help including a part-time therapist. Every decade or so, like clockwork, Tim demonstrates why everyone calls him a genius. My parents had rented the family home when they moved to Mystic, Connecticut, but luckily the latest renters were eager to escape their lease.

So now, I've told you about the Cloudman and why I moved back to New England. I guess the next step is to explain how a dullard like me managed to figure out what Joe was really up to.

If it wasn't for the kind of work I do, I might never have seen it . . .

One nice thing about the Cable-Modem Age: it's quite practical to work more than a few blocks from the office. When things go wrong, however, you've got no one at hand to complain to.

If you've learned about the advertising world by watching, say, *Bewitched* on TV Land, you might have gotten the wrong idea. On TV, ad agencies are places where creative people sit around brainstorming all day—when they're not trying to harvest clients using raw ideas with, perhaps, a few sketches as visual aids.

Well, that's not how it works anymore (if it ever did). HDTV time is terrifyingly expensive, so our field is terrifyingly competitive. In the end, every penny we receive is dependent on customer satisfaction. In order to nail down a final contract, our agency has to produce *finished* products, broadcast-ready, and then sell them to suspicious clients who've been previously wined, dined, and flattered to a turn. There is, as the fellow jumping off the Empire State Building admitted, an element of risk. Finished ads cost real money; making them is essentially making a short but expensive movie. SAG actors don't come cheap, and the famous ones swallow the budget whole. Then there's the writers, the crew, the director . . .

And if you're thinking that computer-generated high-speed graphics must be cheaper, you ought to have a little talk with Tim Burton or Michael Eisner. They can explain in soft voices exactly how cheap it is to do state-of-the-art computer animation.

The harsh truth is that my agency loses money if the final agreement grosses us under two million dollars. The pressure is unbelievable and there is always a looming deadline.

On October 8, 2008, the very night "Team Champ" found the big artifact under Lake Champlain, I was under the gun again. I'd been tweaking this toothbrush commercial scheduled to be unveiled for our client the next day and had run into a problem I couldn't put my finger on. I suspected it had something to do with the voiceover; we'd originally hired David Hyde Pierce for the role, but he'd had to cancel at the

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last minute and his replacement lacked David's flawless timing.

I liked the ad's basic concept. The opening was set at ground level in a grand, but alien forest. Suddenly the point of view flies upwards into a pink sky. The "camera" pans downward. The forest is receding through perspective and shiny white patches appear around its edges. Our intention here was for the viewer, for an instant, to think the entire forest is growing in a vast crack in some gargantuan iceberg. But then, as the camera moves even higher, the truth is revealed: the impressive foliage is merely some salad remnants stuck in someone's molar. A dry voice asks, "Ever get the feeling your brush is leaving a little something behind?"

Clever, and creepy enough to grip the attention. Yet, as I said, something subtle was wrong. I put the first ten seconds of the thirty second piece on "autoloop" and watched and listened to it at least fifty times, feeling more and more uncomfortable and increasingly unsure why. This is the kind of thing that drives Art Directors nuts. Finally, I ignored the visuals and studied my editing program's virtual VU meters.

For no good reason, the Hyde Pierce sound-alike had put a tiny extra stress on the word "behind." Odd, but so what?

So I watched the ad again and froze the picture at the exact moment "behind" was uttered. And then I saw it. If you looked at it carefully, the damn molar looked very much like a stylized bare ass. Perhaps the hidden image would have worked if we were trying to sell liquor or lingerie or toilet paper, but in a toothbrush commercial?

I used my software's automated mixdown to soft-pedal "behind" and used the graphics editor to redact the tooth (luckily this section of the animation was a "cloned" sequence so that redrawing the tooth in one cell changed all three hundred twenty images). Then I watched the spot a few dozen more times before reluctantly e-mailing it to my agency.

The file was vast, over thirty gigabytes, and needed to be uploaded with redundant "shake" demands to confirm that no information was getting lost in transmission. You don't dare compress any file with so much visual detail. Despite the efficiency of broadband and my triple cable-modem it was going to take at least twenty minutes before the transfer was complete. And I couldn't go to sleep until the baby was safely in bed.

Immediate success wasn't a foregone conclusion. Even in the early days of the Internet, the simplest files were broken down into "packets" for transmission. Each packet would go by the most convenient route open at the exact moment it was sent. So one packet might travel from your home to Singapore and then France and eventually to a server right next door to your home, where the message originated. The next packet might go to New Guinea and then on to Bangkok, etc.

Today, of course, information is bounced around from trunk lines to satellites, and broadband modems have made the earlier phone modems all but extinct. But the principle is the same: files are torn into shreds and sent orbiting the Earth like the old-fashioned concept of electrons whirling around atoms. It's dizzying if you think of how many such shreds are in orbit at any given time.

But the bigger the file, the more it will be bounced around, and the bigger chance there is that something tiny will go wrong. Odds were about fifty-fifty that I was going to have to redo the upload several times.

With nothing to do for the moment but fret, I leaned back in my chair and caught up with how tense I'd become. My left hand was misbehaving, clenched tightly enough to break a pencil, and my legs were numb.

I forced myself to stand up and went for a long walk, all the way to the back door, partly to stretch and partly to find

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out how cold the night had gotten. But when I saw the clouds glowing faintly from the gibbous moon . . . I remembered Uncle Joe and wondered if he was watching the same clouds from his usual haunt at the beach.

The idea was ridiculous; it was ten past eleven and surely the man slept *sometime.* Assuming, that is, he was still alive—no one had mentioned Joe since I'd been back; but then, people tended to take him for granted . . .

It upset me that I hadn't bothered to ask about the Cloudman. Now, I couldn't stop thinking about him. And the more I thought, the more I wanted to go see if he was still down there. Could I make it the entire two and a half blocks without help? I hadn't walked that far in a single stretch since the accident.

I was lucky, the file went through on the first attempt, but I didn't do the sensible thing and go to bed. Instead, I put on a jacket and pulled the crutches from my closet. But then I remembered that my favorite physical therapist, Ms. Deborah Bloom, had suggested I stop using them. "You'll never fully recover, Mr. Burns," she had told me without a smile, "if you insist on using crutches as a crutch."

The hell with it, I thought. It's only a few stone-throws away, for God's sake. I could *crawl* there and back if I had to. So I obediently left the crutches behind and cautiously hobbled down my porch steps, determined to show the sidewalk who was boss.

The final half-block was terrible. It was all downhill, which was much harder for me than uphill. My legs and hips were killing me, and with every step, white-hot needles stabbed into my tailbone.

When I came to the parking lot directly behind the beach, I had to lean on the bike-rack and simply breathe for a few minutes. I felt like I was six again, recuperating from carrying Atlas's Sack. Looking toward the surf and shading my tired eyes against the weak glare of a distant street light, I grew an instant set of goose bumps. I hadn't really expected to see him but the Cloudman was there all right, facing the sea as always, and as usual, looking upwards.

His setup hadn't changed either. The same big easel was tethered to the ground by staked ropes—in my whole life, I'd only seen it blow over once. The narrow tray that Joe used in lieu of a palette was still clamped to the front of the easel and I wondered if he still rinsed it in brine and scrubbed it clean with wet sand . . .

Walking through dry sand in my condition was no picnic. By the time I reached Joe, my lower body was going into painful spasms.

"Good evening, young Gregory," he said warmly without glancing in my direction. He raised both arms in a gesture that took me back nearly thirty years and pointed at the sky with fingers and brush, his hands hanging in the air as if they were floating. "The Moon visits the House of Aquarius bringing—ah! There's one now!" His arms descended and he resumed painting. "Did you see it? That shooting star? How it streaked toward hidden Sagittarius like one of his own arrows in reverse?" The man still had that phenomenal voice and that rococo way of expressing himself.

"For God's Sake, Joe! You *remember* me?" I was doubly amazed. He hadn't seen me in eighteen years and not only had he recognized me instantly—and apparently without looking—he'd remembered my childhood fascination with astronomy.

"*Remember* you, my young friend? October's pet, mighty, flighty Pegasus, watches from above as I watch from below and neither of us . . . knows how to forget." The artist shook his head, perhaps a bit grimly, and continued in a more casual tone. "Truthfully, I've been expecting you for weeks."

"Sorry, Joe, I've been meaning to get

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down here ever since I got back, but—did you hear what happened to me?"

"Certainly. Your parents keep in close touch with their friends here, do they not?"

I stared at the Cloudman's homely profile and thought about the absolute trust the neighborhood had placed in him and the countless happy days I'd spent under his occluded but oddly watchful eye. This man was *important* to me and I'd never fully appreciated it before.

"Uncle Joe, I've . . . I've missed you. Terribly."

"Bless you for saying so. I've missed you too, Gregory. You were a delightful child. Intelligent and good-hearted and always so *inventive.*"

"Inventive? Oh. You mean about causing trouble? Jesus! How embarrassing. I never thought about it from your point of—I must have caused you one hell of a lot of grief."

"Why be embarrassed? I knew you were doing it for the sake of your hand."

For the second time tonight, goose bumps sprang to attention. The back of my neck tingled.

"You were *aware* of the effect you were having? That's . . . very interesting."

I stared down at the little water-filled atomizer the painter used to keep his paints moist as they sat on the tray, but found no answers. Children easily accept things adults would find incredible and I was no longer a child . . .

"I don't get it, Joe. What *are* you? Some kind of . . . healer?"

The old man sighed deeply and the breeze carried a faint yeasty scent of fresh bread. "Since you ask so politely, I will tell you exactly what I am, but I cannot explain it: I am a city."

"What? Did you say 'a city'?"

"Ask no more questions. Not now. But I have heard tales of the torment in your legs. Why don't you take my hand now as you used to—you needn't even misbehave!—and we shall see what happens."

This offer seemed so bizarre that I felt as if I'd suddenly landed in some lunatic's dream. But I remembered how much Joe had done for me when I was young. So I accepted, held his right hand with my left, and felt awkward and foolish—until my knees suddenly began to tingle. At that point, I couldn't think of a thing to say and wasn't even sure what to think, so I just scratched my legs surreptitiously and watched the man paint.

He'd lost none of his skills, but his art looked different in the moonlight. Although it was nearly midnight and the Moon was getting low, the night was so clear and my vision so adjusted, that the sky was surprisingly bright. There were clouds up there, puffy and pearly cumulous jobs, but not too many. They were as still as if they'd been nailed to the stars.

The matching clouds in Joe's painting were extraordinary. They were obviously modeled on the real ones, but the artist had taken liberties. The faint extrusions on the painted billowy edges seemed close to forming recognizable shapes, and the intensity of light in the centers made the clouds suggest distant nebulae or coalescing galaxies.

What most grabbed my eye, however, were the dark spaces *between* clouds. In daylight, they wouldn't have seemed so prominent; besides, the way I'd spent my evening had left me acutely sensitive to forms. Some dark spaces didn't match the real sky at all. These particular shapes were unfamiliar—or maybe I'd seen them in Joe's paintings before and they hadn't quite registered. Each such shape had the purposeful and simple design usually associated with written letters or numbers. One looked like a "V" with a cloverleaf blob in the middle. As a graphic artist, I know a *character* when I see one. But if these were letters, I wondered, what was the language?

"Have you left some of your pain . . . behind, Gregory?"

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For an instant, Joe canted his head and the moonlight glinted slyly off his cataracts. The tiny stress he'd put on the word "behind" put the crowning touch of oddity on the evening. I was sure the emphasis had been deliberate, as if the Cloudman had somehow known about the problems I'd had with the toothbrush commercial.

"Joe," I began, but then wasn't sure what to ask or how to ask it.

"Your legs? Better or no?"

"My God! I hadn't realized . . . this is *incredible* . . . the pain is gone! I mean completely! How could—I don't remember my hand changing so—"

"Yes, yes." He sounded a bit distracted, as if he was already thinking about something else. "The slowest part is setting up the basic channels but we'd already done that when you were younger. Once the system is in place—"

"What the hell are you talking about, Uncle Joe? How is this *possible?*"

"Ah, please accept my regrets! I shouldn't talk so much when I intend to tell you so little. There are some things, young Gregory, that an old fool should not hope to explain."

I couldn't get him to say anything more on the subject and I felt too happy about the pain ending and too confused about why it had ended to keep trying. After a long stretch of surprisingly companionable silence, I said goodnight, promised to return soon, and headed for home. On the way, I tried to glimpse Pegasus through the glaze of the streetlight, but couldn't. My legs felt absolutely wonderful. The old punchline, "it feels so good when it stops," kept going through my head.

But underneath all that, I was troubled. I don't like to think of myself as the kind of person who can't believe in miracles; but I sure as hell don't believe in *magic.*

I have learned, by trying everything else, that I function best by getting up at the same time every morning no matter how late I go to sleep.

Which didn't make it any easier to force my body out of bed when the alarm sounded. And when I went to the kitchen, my coffee wasn't brewed. I'd remembered to get the morning's coffee ready to go, but I must have forgotten to push the damn timer button. Only a fellow addict will understand what a blow *that* was.

Cursing myself, still too groggy to notice that I'd been walking around like a normal person, I switched on the Krups, flopped on the couch, flipped on the TV, and stared at the flatscreen in a caffeine-deprived stupor. The channel was set to one of those morning shows where they rarely scratch more than the gloss on the surface of an interesting story. Truthfully, I was paying more attention to the happy squeals and grunts of my elixir brewing . . . until the report about "Team Champ" came on.

Since spring, a team of crypto-zoologists had been working up near Burlington, Vermont, doing research in Lake Champlain. The team had the latest multi-source sonar and side-scan sonar equipment, a big boat, two mini-subs, and one dubious goal: to finally track down (if it existed) the local version of the Loch Ness monster, the ultra-elusive "Champie." This was a huge job; the *surface* area of the lake is over 450 square miles . . .

Like other such expeditions before them, they found no dinosaurs, giant sea serpents, or even the prehistoric whales some had predicted, but early last evening they had apparently located something else, something that made my eyes spring open pre-coffee.

One of the mini-subs had contained a kind of high-tech beachcombing device called a "proton magnetometer," which was highly sensitive to the presence of buried metal. The magnetometer had gone nuts over one of the deepest parts of the lake and when the boat reached the spot and applied its deep sonar, it got back a strange sonic "fingerprint."

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There, buried beneath tons of muck, was evidently a large oval object, fifty meters across the widest part. The scientists weren't sure what the thing was or what kind of alloy it was made of, and they sure as hell didn't know how it got there or where it came from. But it was clearly something *manufactured.* Naturally, the TV hosts tried to make everyone on Team Champ use the word "spaceship," but none of the scientists would play along.

From the thickness of silt, one team member had estimated that the object had been sitting on the bottom for two hundred years. There was no saying how much longer it would keep sitting there. Champlain gets as deep as 400 feet and extracting such a monstrosity and getting it on dry land was a problem nearly as heavy as the artifact itself.

At the moment, scientists and engineers were modifying the mechanical arms on the mini-subs, adapting them for goo-removal and cleaning. With any luck, they'd soon have pictures of the object's surface.

Rich food for thought. Possibly too rich.

The report ended and I wasted some time flipping channels, hoping to find out more on the subject. Finally, when I chanced upon one of my own commercials, I decided that coffee couldn't wait.

I sprang to my feet and suddenly realized what I'd just done. Then I shouted with joy and started dancing around the room like a maniac.

After settling down and finally pouring myself the first cup of the day (and, I might add, the most important), I wasted an hour in useless speculations and another hour in chasing down the Lake Champlain story on the Internet. The only new thing I learned was that the latest side-scan sonar systems can detect objects as far away as two thousand meters, but only have good resolution up to a thousand meters.

Then it occurred to me that there were phone calls I should make. First, I cancelled the scheduled grocery delivery for the day. My legs weren't quite what they'd been the night before, but I could easily do my own damn shopping now. Then I rang up Dottie Kierkenbart who was this year's Resident Coordinator, told her my condition had suddenly improved, and asked her to include me in the "food-bucket brigade." She said she was delighted I was better and that, starting in two weeks, I could bring Uncle Joe his lunch on Tuesdays and his dinner on Saturdays if it wouldn't be too inconvenient.

The one person I should have called but didn't was my therapist, Deborah Bloom. I wanted to see the expression on her beautiful face when I jogged around the room. I have to admit it: I had hopes for a different kind of future relationship with Ms. Bloom.

After one last call (to the office to see if the clients had been subjected to the commercial yet—they hadn't), I strolled back to the beach. This time the trip seemed as short as it was.

The weather was sending mixed messages today. It was warm enough when the wind wasn't blowing, but the frequent gusts seemed to come straight from the Arctic Circle.

The Cloudman owned several extra layers of clothing he would don in subfreezing weather, but a mild chill like this was nothing to him. He was still dressed in the familiar gray pullover that had seen better decades.

In the daylight, I noticed something I'd missed the night before: Joe hadn't changed much, if at all, in eighteen years. Of course, he'd always looked about as old as anyone could get . . .

"Ah, young Gregory. How are the legs this glorious morning?"

Joe was working on a new painting but I spotted some of the same negative-space shapes I'd seen the night before. Most were upside-down or sideways to their previous orientation, but—

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"Gregory?"

"Sorry, Uncle Joe, I got distracted. My legs? You're a wonder worker; that's for sure! I'd still like to learn how you—"

Joe was shaking his head ruefully, "Yet you are still in some pain?"

"It's trivial, really. Absolutely nothing compared to what I've been going through. I figured maybe a few more of your . . . treatments?"

"No. What your legs require now is *use.* I'm certain your friend will know just the right exercises."

"My friend? You mean Deborah? Who told you about *her?*"

"People here are so interested in each other. Isn't it comforting to live somewhere where neighbors look after their own?"

"Oh, they *look* all right! Sometimes I think this place is more like a damn fishbowl than a community! Which reminds me . . . there was the strangest story on the news this morning. Did any of the local gossips happen to mention a big object found up at Lake Champlain?"

"No. What kind of object?"

"Something huge and oval although they can only 'see' it with sonar at the moment. It's buried in the muck below one of the deepest parts of the lake."

Joe actually stopped painting and turned to face me. That might not seem like a big deal to you, but to me it was like the sun suddenly turning blue.

"Please, Gregory. Tell me everything about this." He returned to the canvas *slowly.* His usual motion, if he had to step away from his work for a few seconds, was closer to a rubber band snapping back.

So I repeated what little I knew and the Cloudman painted as if he wasn't listening. But he was breathing unevenly and his hands were trembling slightly; I've seen rocks less steady than Joe's hands. When I was done, he asked only one question:

"What do these scientists believe they have uncovered?"

"They aren't saying, but the *way* they're not saying it . . ."

"Yes?"

"The media people are obviously hoping it's a real live flying saucer. Fat chance! But the scientists look nervous, as if they know damn well they've stumbled onto some top-secret government project. One professor claimed that from the amount of silt on top, the 'spaceship,' whatever it is, could have been there for two centuries."

"That's what he said? Two centuries?"

"Sure, but I seriously doubt anyone believes that, including the professor himself. It's infinitely more likely that someone simply buried the thing, although I can't imagine how." I chuckled. "If it had really been there that long, I guess it *could* be a crashed flying saucer."

"And you think the scientists looked nervous?"

"One engineer kept looking over his shoulder during his interview as if he were expecting feds to be sneaking up from behind."

Joe muttered something under his breath and I got such a strong feeling he needed to be alone, my refurbished legs carried me off almost before I could say goodbye.

The Cloudman's reaction was so out of character, it threw me for a loop. I went home, flipped on the TV and was just in time to catch a new report on the "Champlain Flying Saucer."

The mini-subs had already cleared a few square feet of the machine's surface and there was a live, underwater picture of what that surface looked like. The metal had a slightly rippled pattern, like the friction-reducing texture on the skin of a submarine. But on the very fringe of the cleared area, there were a series of faint impressions that suggested letters or numbers of some sort.

Maybe I was seeing things, but one of those shapes sure looked like a "V" with a cloverleaf blob in the middle.

The live report went on and on, but

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the reporters had run out of news and were just repeating themselves and interviewing each other. The scientists refused to make further comments. They still looked nervous, but the nervousness somehow had a whole different flavor.

That did it. I turned off the TV and stared at the blank screen.

For God's sake, Greg, I told myself. What are you so damn afraid of? Joe has done nothing but good things for you. So stop thinking and get off your ass and *do* something.

Every once in awhile I actually listen to my own advice. So I decided to take on a major housecleaning project just to get my mind off all the things I didn't understand.

Besides, with functional legs, there was one mystery I *could* solve: I could finally find out what the hell was stored in the attic. My excuse for going up there would be to stow away some odds and ends (like my crutches).

It might seem odd, but I'd never in my whole life been up there. The attic had been strictly off-limits when I was a kid—too dangerous, my parents had claimed—and my dad had even kept the pull-down staircase padlocked to keep my hyper-curious brother out. The door was still padlocked, but now I had the key.

For me, this was something of a rite of passage. I stood on a kitchen chair, unlocked the overhead panel, and tugged on the cord until the old hickory stairs reached the hallway floor. Mustiness wafted down from above. With a silly sense of achievement, I climbed.

They say a great deal of house-dust is shed human skin. If so, some giant must've been homesteading my attic for centuries.

My flashlight spotted the chain for a dangling light-fixture and when I pulled, I was surprised that the bulb worked. I took one look around, shook my head in dismay, and started organizing the place. The ocean of time had left vast deposits up here and had apparently left them at random. Fifteen minutes into the chore, I moved an enormous birdcage aside. Who, among my relatives, had ever owned a peacock or possibly a falcon? Beneath the cage was a gray, nearly flat cardboard box.

Inside the box were old photos of the earliest settlers in this neighborhood which included my grandparents (on my Dad's side). I suppose "old" is redundant; there will never be any *new* photos of these people. The pictures had browned with age but they were still clear enough, and the bare bulb overhead was bright enough, to show details. It was those details that had me sitting down on the rough wooden slats of the attic floor, my mouth hanging open.

The photo at the top of the pile, a nice example, showed my grandfather, Arthur Burns, standing next to the Cloudman. The pair had their arms around each other's shoulders and the Cloudman looked every bit as old and odd as he'd looked two hours ago!

I'd been working so hard to think about anything else and here it was again, staring me in the face. Just how *old* was Uncle Joe? And exactly how odd?

My father wasn't evasive on the phone when I called him up, but he sure as hell wasn't forthcoming.

"I'm sorry, Greg," he finally declared. "I see what you're getting at, of course, but any . . . secrets up at the Cape aren't *my* secrets, if you get my drift."

"Damn it, Dad, at least me tell one thing. Did Grampa Arthur ever tell you why he had such a close relationship with Uncle Joe?"

"What . . . whatever makes you think he did?"

"I found some old pictures in the house. Every time Grampa and the Cloudman are together, they've got their arms around each other like long-lost brothers."

My father broke a short but awkward

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silence with a growl of irritation.

"Damn it! I thought we'd taken all the . . . mementos *with* us."

"Mementos of what, Dad?"

"Talk to Joe first, son, then call me back and—oh hell! Just tell me what he *said*. We'll take it from there."

I didn't want to confront Joe. I may not be as brainy as my brother Tim, but I'm not completely stupid. All the signs were pointing to utter strangeness and I wasn't ready to go there yet. So I drove to the supermarket (thanks to my therapists and their horrible exercises, I'd been able to drive my own car for some time). I made every effort to shop like a person who wasn't suddenly living in the damn Twilight Zone. But by the time I returned home, I understood the basis for the phrase "scared stiff." Fear was making its own kind of skeleton inside my body.

And there was a man waiting for me, sitting on my front stoop. When I saw who it was, I pulled into the driveway in a kind of numb, frigid shock.

"Joe. What are you *doing* here?"

The Cloudman's folded easel was resting against the front wall of my house along with a huge bundle wrapped in Joe's plastic tarp. I stared at the easel and decided that I'd never seen anything look so out of place. Then I looked again at my visitor and realized how very wrong I was.

Joe just regarded me for a minute before he responded. "Beautiful afternoon to you, young Gregory. May I come in? I've a vast favor to ask."

"Of course, of course. Let me, uh, just grab my groceries from the car . . ."

"I would be honored to assist. Your legs are holding up, no?"

"Yeah. They're still holding me up all right."

I walked into the kitchen, Joe right behind me, and the back of my neck felt cold as an ice-cube. I wouldn't have placed my bag on the counter more gently if it had been full of loose eggs.

"Can I . . . fix you something to drink, Uncle? I don't have any of that Juicy Juice you used to like, but there's some cherry cider?"

"That sounds delicious," he said. "But too much sugar makes me giddy. Would you mind terribly thinning it down with plain water?"

"Not at all." I remembered exactly how Ma used to ruin his juice.

My hands shaking, I poured my guest his weak drink, little more than colored water really, and put away the perishables.

"Let's—" my voice had come out squeaky so I tried again. "Why don't we, uh, sit down in the living room and talk."

The sight of Joe perched on the couch opposite my leather chair gave me what my brother likes to call "cognitive dissonance" but I think "the willies" comes closer. The yeasty scent was stronger indoors and not quite as pleasant . . .

My guest and I studied each other for at least a minute and I tried to remember that I'd known the Cloudman my whole life. Then he noticed the photos I'd left scattered on the coffee table between us. He made a "may I?" gesture with his bushy eyebrows and when I nodded, he picked up the stack and went through them slowly, one at a time. His wrinkled cheeks widened in what, for him, was a broad smile.

"Those were grand years, Gregory, if lonely at times. Art was my friend and mentor. He set me up here. Did you know that?"

"Joe—honestly, I don't know anything about anything and that apparently includes Grampa."

"Art was a good man with a surprisingly . . . flexible mind. I was lucky that he was the one who found me."

"Found you?"

"Ah, Gregory! You have become afraid of me. The truth is not so dreadful and I intend to explain. I believe you have inherited many of Art's finer quali-

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ties and I urgently need an ally."

"For what?"

"You must understand that we came here initially, my . . . ah, what would be the word? Wife? Husband? Fellow city-state? Let's say my 'mate.' Drawn by your radio signals, we came to study the intelligent inhabitants of this world and—"

"This world?" I don't know why I said that, I already knew that Joe hadn't been born on Cape Cod. But what had to be the truth simply wasn't possible, not in real life. Not in *my* life.

"Think of us as . . . in this one case, I think the term "anthropologists" would be apt. My mate remained in the Craft Major and I took the Craft Minor down to the surface, to explore."

I was starting to feel very detached and light-headed. I wondered, almost idly, if I was about to pass out.

"OK, Joe, I can guess what you're going to say next. It wasn't hard to put together. You're such a . . . an unusual person to begin with. Then I tell you about a strange discovery of something that looks like a damn spaceship and you start acting weird and suddenly leave the beach for the first time *ever* and show up at my house. That thing up at Lake Champlain—it *is* a spaceship and it's *yours?* Right?"

"From your description, I'm certain it's our Craft Major."

This confirmation, totally expected though it was, turned my arms into an instant forest of goose bumps. And I still couldn't accept it. If there were any such thing as a visitor from another planet, surely they wouldn't look so human? I mean Joe looked odd, but not odd enough. And surely they wouldn't have human senses or know English and eat bananas or turn out to be painters and baby-sitters?

And what a bizarre, unbelievable twist on the idea of First Contact! What happened? Did the Cloudman mosey down the ramp of his starship, walk up to the first human he saw and say, "Take me to your beaches."

But if he *were* an extraterrestrial . . .

"You say you came here to study us, Uncle Joe? Must be a long study."

"Far longer than we'd planned, my dear Gregory. When I took the Craft Minor too close to one of your cities, it was terrible! I was unprepared for the *cacophony!*"

"What do—"

"My people are sensitive to . . . certain electromagnetic patterns. Your cities are awash in such fields, building and collapsing endlessly. Beings on my world communicate with similar, but more organized patterns. It was like listening to a million insane voices at once. I became disoriented and couldn't adjust in time."

"So we're noisy neighbors?" I realized that I was, all at once, handling this much better. Or maybe I'd gone into a new level of shock. At least I was no longer freaking out. And I was actually getting involved in what Joe was trying to tell me rather than, say, running around in circles and screaming.

"Ah, Gregory, that was a dark time! When I got close to Boston I lost control of my vessel and—well. My people are very, very durable, we can survive more acceleration than you could imagine, but we are not utterly proof to sudden impacts. I was injured in the collision and had to make considerable . . . adjustments before I could leave the wreck of my craft.

"Then, once outside, I simply couldn't manage the overall signal level, not at first. And the oxygen here is uncomfortably diluted and the gravity somewhat feeble. Still, like a fool, I ignored my own injuries and other warning signs and set out to do my work. My ship's communication system was ruined, so I left a visual message at the crash-site and changed into a flying form to—"

Jesus! "A *flying* form? What kind of creature are you, Joe?"

"I told you already: I am a city."

"But what does that mean?"

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"Do you really want to know? You may find the information a bit disconcerting."

"Tell me."

"Very well. Life, on my world and yours, began in the oceans. But the seas of my planet are relatively shallow with constant volcanism beneath. One-celled life had to react almost instantly to an unstable, unsafe environment or die. For those early eukaryotic cells—cells with a nucleus—survival long enough to reproduce was almost a miracle. And mitosis itself, especially cytokinesis, where the cell actually divides, had to be extremely rapid."

"You seem to know a lot about biology, Joe."

"For good reason, my friend. As I was saying, on my world, radical evolutionary experiments, unless they were a spontaneous success, were doomed to failure. Multicelled life appeared again and again and it never thrived. But the simple protozoa *themselves* evolved; they grew larger and stronger and developed primitive organs of locomotion and specialized sensory organs.

"Eventually, conditions stabilized somewhat and successful multicelled forms emerged but by then they were actually at a disadvantage because they were, at least initially, more vulnerable than their solitary cousins."

"Then how did complex creatures ever get started?"

"Not easily. After millions of years, your years, the single-celled animalcules learned how to form cooperative colonies. Such colonies were finally able to leave the seas and live on dry land. Slowly, each colony developed a kind of . . . group consciousness and group purpose that greatly enhanced the chances of survival. And survival was even further enhanced when the colonies learned to communicate and develop social relationships with each other. And they developed a way of reproducing as a group, duplicating the many genetic benefits of Earthly meiosis. My mate always maintained that our evolution reached its pinnacle when we learned how to love."

"I'm starting to get it. Your body is like a city of one-celled creatures. Kind of . . . nanobiology. But how does that differ from life here? Couldn't I say the same thing about my own body?"

"In your case, the cells have become specialized and distinct. In my case, each cell is free to roam around and take up any needed task, or replace a cell that needs rest or food. The tentacle-like fibers that propel the cells can link to each other in many ways, creating bone-like structures or contracting membranes like muscles, making neural pathways, setting up sensory organs, passing nutrients along to where they're needed."

"Incredible!"

"And they are not limited to staying inside my 'body.' My actual body is what I make of it. My beach, for example, is covered with nerve pathways, that's how—"

"Hey! That's why I've never been able to sneak up on you!"

"Once you set foot on my beach, we are in contact. In fact, at this very moment, your body contains multitudes of my cells allowing us to communicate and—"

"What do you mean 'communicate'?" The notion that Joe was generating some kind of harmless plague wasn't a pleasant one. "Aren't we just . . . talking as always?"

"We have never talked. Not the way you think of talking. I've tried but I've never managed to grow functional vocal cords."

I heard Joe's wonderful voice saying those words, but this time his lips didn't move.

The effect wasn't reassuring. "So what the hell are we doing right now? Telepathy?"

"I have learned—my individual cells have learned—to induce auditory impulses in the nerve fibers coming from

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human ears."

"Good Lord! But you can't, uh, read my mind?" That may seem like a stupid question. But there's one thing about dealing with an extraterrestrial, even one who's supposedly an old friend: you don't know the rules.

"Read your mind? I hear your words; I do have functional ears. And my cells relay subvocalized movements of your throat and mouthparts. Since humans often think, in effect, by talking to themselves, I can't help but be aware of some of your thoughts."

"So, if you—" an exceedingly creepy thought occurred to me. "Um, what do those . . . on-sabbatical cells of yours *eat,* Uncle Joe?"

"Almost anything organic with the right chemical compounds. Largely bacteria. At this moment, I am feeding on the abundant germs of your kitchen sink. Your poor housecleaning has offered me a feast and I thank you."

"Wait a second! You've set up an . . . external nervous system inside my house?"

"And on your front walk. I wouldn't have been able to converse with you otherwise."

"My legs!" I'd gotten a startling flash of insight. The missing puzzle piece had, at last, fallen into place and for the first time in my life, the assembled picture held meaning and logic. "And my hand. It wasn't some arcane magic. It was *physical:* your cells healed them!"

"Yes, you are beginning to see the pattern. It takes a great many cells for such healing. So many cells in motion would be visible to the human eye; that's one reason I've always needed to touch you to facilitate the exchange. Also, channels within your body needed to be established to permit the proper flow. Years ago, when I began working on your contracture, it was most efficient to keep our hands in direct contact."

"How long can your cells live in my body?"

"You are concerned that the healing will be reversed once my cells depart?"

"The thought just occurred to me."

"You needn't fear. What is healed is healed. In fact, most of my cells working on your legs have already returned to me, but I always like to leave a few in case of emergency."

It took a few seconds before I caught the full implications. "So that's why I didn't die after the accident."

"I cannot say for certain because those cells are no more. But those parts of me that took up permanent residence in you assumed responsibility for your body as if it were their new colony. There were too few to truly heal you but I'm sure the cells did what they could, expending themselves to preserve your life and repair as much damage as possible."

"Thank you, Joe." I said quietly, feeling humbled by this latest revelation. "I guess you've been taking care of me my whole life in ways I never imagined." I was experiencing a vast but odd sense of relief: the Universe was strange, strange indeed, but at least it made sense now.

"Where were we?" I asked. "Weren't you saying something before about changing into a 'flying form'?"

"I was telling you what occurred after I crashed. I set out to explore this area from the air."

"What happened?"

"I don't remember, I was badly disoriented. Perhaps I misjudged the winds or simply flew into something. As I told you, I am not completely unaffected by physical shock. I must have passed out and it was your grandfather who eventually found me lying unconscious on some rocks near the shoreline. When I awoke, I was in a large cage and Art had evidently been trying to nurse me back to health for days."

"So Grampa thought you were a *bird?*"

"No, but he couldn't imagine anything else I could be."

"My God! I just saw that cage today!

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You must be smaller in your, uh, flying form."

"Not really. I've had to grow a bit since I landed."

"What did Grampa say when you . . . *spoke* to him?"

"Do you imagine that happened overnight? I have some natural advantages in learning, ah, foreign languages. But it took years to properly associate sounds with meanings and years more to understand the human body. But when I finally did—as I mentioned, Art had a remarkably flexible mind."

I was staring at my former mentor in horror. "Don't tell me Art had you locked away in a cage for years!"

"No locking was involved. Besides, I cannot be trapped by wirework."

"Good. When did you start looking the way you do?"

"That also took considerable time. I fear that my talents for mimicry are feeble. Frankly, I've been surprised this . . . vague appearance has sufficed for so long. But then I've helped things along a bit now and then."

"What do you mean?"

"To some degree I can alter the direction of human thinking."

I didn't like the sound of that. "How?"

"It's a matter of inducing subvocal nerve-signals. I told you that 'thinking' for your kind is basically talking to yourselves?"

"What about for your people?"

"We think in soundless symbols. Each symbol of meaning has evolved to be a specific shape and we can influence each other by how we assemble these shapes. Likewise, if I speak to you in your own inner voice, I can usually steer you away from the wrong thoughts."

This was chilling news. "Now you're scaring me, Uncle Joe. How am I supposed to tell—"

"You'll have to trust me in this, Gregory. I would never misuse this ability. But certain people, your brother for example, would have been far too curious about me if I'd just let nature take its course."

"I suppose so. Yeah, Tim would've been all over you, now that I think of it. All right, I do trust you; I guess it's an old habit. Let's continue. You crashed, Grampa rescued you, and you eventually learned to communicate. What happened then? Why didn't your . . . mate come down and rescue you?"

"I believe . . . let's apply the pronoun 'she.' I believe she tried. I suspect she herself encountered the problem that caused me to crash."

"Oh. Do you think . . . she might have survived too?"

"I wasn't sure until today, but yes; I'm certain she did and that she landed more successfully than I."

I frowned. "What makes you so sure?"

"You said the scientists estimated two hundred years of silt on the buried craft?"

"That's right. But—"

"We only arrived seventy-five local years ago."

I stared at my unexpected guest stupidly for a few seconds before I got it.

"She covered up your ship."

"And this implies the Craft Major is still, at least to some degree, functional."

"Lord! All this is going to take some serious getting used to, Joe. And didn't you say you wanted to ask me a favor? What"—I nearly said "on Earth"—"do you want me *do?*"

"A nest of favors, I fear. At least I've already taken care of some lesser matters. While you were out, I was visiting some of our neighbors."

"Really?" Fifteen minutes ago, the thought of the Cloudman strolling along the local sidewalks and knocking on doors would have been inconceivable.

"I asked Benjamin Olds to stop stretching new canvasses for me." Joe gave me his version of a smile again. "Did you suppose they simply appeared like mushrooms?"

"Maybe I did. Who else did you see?"

"Dorothy Kierkenbart who handles my banking, and Gerald Volleski."

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"You needed a *lawyer?*"

"That brings me to the first of the favors I ask. Here in this pocket, I have some papers for you to sign."

I looked over the documents Joe handed me and didn't get very far. What stopped me was seeing the Cloudman referred to as "Joseph Beck."

"Did you take on that last name because of the beach, Uncle Joe?"

"On the contrary. Art thought I merited a family name and 'Beck' was his great-grandmother's."

"Oh. The beach is named after *you?*"

Joe just smiled and my eyes drifted back to the papers.

"You're leaving your money to me? Why? You're not . . . going somewhere, are you?"

"I must. My mate doubtless left instructions for me, telling me where to find her. My kind are very long-lived compared to you humans, with a corresponding view of time, but this . . . this infinite separation has gone on so painfully long . . ."

Joe's eyes weren't exactly filled with tears, but his cataracts had turned strange and glossy. Somehow I sensed what he was feeling.

I was experiencing some pain of my own. The thought of the Cloudman leaving. . . .

"God, I'll miss you, Joe. Whatever you are, I know you're a good person. I hope you'll . . ." I'd glanced down at the paper on my lap and the figures finally registered. The Cloudman was giving me a *lot* of money.

"Jesus! What am I supposed to do with this kind of wealth?"

"I want you to have enough to keep you comfortable. The rest, donate to medical research. I won't be around here to heal the crippled young ones but . . . I need to know the healing will continue. You will have to do much research yourself to find out where the money should go."

"I'll try my best."

"I trust *you.* Look for ways of helping others but always help your neighbors first. I also need for you to make a few phone calls for me. Since I have no vocal cords, I can't use a telephone."

"That's right. I hadn't thought of that. What else don't I know about you?"

"I don't have time for more, my dear friend. My heart, although I don't really have one as such, won't let me tarry. Here is a list of the people I want you to call and what I want you to tell them. But the most important favor remains. Please wait a moment."

Joe left the room and I heard the front door open and close. A minute later, the Cloudman returned bearing one of his large paintings. It must have been wrapped in the bundle I'd seen outside. He handed me the canvas, studied my face, and smiled.

"If I'd known you *wanted* one of these, Gregory, I would have given you one years ago."

"So this *is* for me, Uncle Joe?"

"Yes, but I'm not giving it away out of generosity. I want to ask the biggest favor of all: I want you to keep living right here for at least two more years. And tell everyone you know that if someone . . . a bit unusual comes by, asking after me, they should steer him or her to you."

"And I should show the person this painting, right?"

"Right. Will you do these things for me? Are they too onerous?"

"Not at all! It seems a small way to repay all you've done for me. Besides, my legs may be better, but I've gotten used to being back home. Hell, I may *never* move back to the city. But Joe, what's this last favor all about?"

"Insurance, my friend. In case my mate finally encounters one of my many . . . messages and comes here while I'm out following a message of hers. Enough! It would require a million words more for you to fully understand and I wish to leave before this sun sinks. Farewell, my young Gregory, we may yet meet again. If I succeed, I may send you a sign when Orion again becomes

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the darling of your night sky."

After he left, the house felt terribly, terribly empty. And I realized that I hadn't asked him the question I was most interested in. But it didn't matter; I already knew the answer.

It's the middle of December now, and Orion is well upon us although I haven't seen any "signs" yet. I also haven't been down to Beck's Beach since Joe left.

The final day of October, the day after the object under Lake Champlain abruptly vanished, my father showed me pictures of Grampa Arthur as a young man, maybe twenty years old, along with pictures of Dad himself at the age of six. Both my grandfather and his son had once suffered from a crippled left hand . . .

I began to understand why the neighborhood trusted the Cloudman.

Then in early November, I had a crazy idea. As the Art Director of a major ad agency, it was easy to insert Joe's mysterious negative-space letter-forms (the painting he left was my model) in many of our new commercials. If the Cloudman hadn't found his mate yet, and she spent any time watching TV, she wouldn't be able to *avoid* seeing his message sooner or later.

So I've been waiting for her, or maybe him; I'm betting I'll be able to recognize her by her "cataracts." My guess is that Joe's eyes were rather like compound eyes, solid blocks of cells, each adjusted to pick up a small dot of the available light. He must not have been able to color them properly without messing up his vision. I'm thinking he needed to see well in order to paint his clouds.

Meanwhile our latest clients have received a lot of mail questioning some odd shapes they've seen in recent ads. You wouldn't think anyone would notice such things, but you'd be surprised what some people will notice. A few such individuals have pointed out that the shapes are really letters in a language only known to Satan and his minions. Other inquiring minds suspect a prize awaits anyone who can decode a secret clue. Other people . . . you get the drift.

So to all you worried folks out there with excess time and imagination, I don't have all the answers, but here's what I think. I think Uncle Joe's paintings contain directions, or coordinates, or whatever you want to call them; but I think some of those shapes had an entirely different purpose.

Maybe I'm a romantic, or maybe it's because things are going so well with Deborah and me, but I think Joe spent seventy-five years painting love letters. ■

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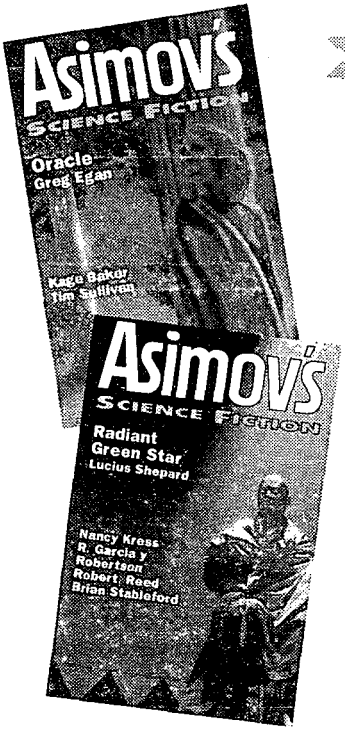

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Probability Moon, Nancy Kress, TOR, $23.95, 334 pp. (ISBN: 0-312-87406-5).
The Essential Hal Clement, Volume 2: Music of Many Spheres, Mark L. Olson and Anthony R. Lewis, eds., NESFA Press (P. O. Box 809, Framingham, MA 01701), $25, 512 pp. (ISBN:1-886788-07-8).
The Frank Collection, Jane and Howard Frank, Paper Tiger, $24.95, 112 pp. (ISBN: 1-85585-732-4).
Josh Kirby: A Cosmic Cornucopia, David Langford, Paper Tiger, $24.95, 112 pp. (ISBN: 1-85585-731-6).

E-Books

Asterisms, Peter L. Manly, Third Millennium Publishing (http://3mpub.com), $5 download, $17.50 trade paperback, 194 pp. (ISBN: 1-929381-35-2).
Dream Sequence, Steve Lazarowitz, available in HTML and Rocket eBook formats, Crossroads Publishing (http://www.crossroadspub.com), 250 pp. eq., $3.50 (ISBN: 1-58338-316-6).

Because of the nature of this magazine and its publishing mechanics, I write these reviews about six months before you see them and eight months before the date on the cover (I'm starting this October column in February!). The books I review have been awaiting my attention for weeks and sometimes months. Some of these books are bound galleys, which will be published in the next month or so. Some are hardbounds and paperbacks that were published a month or so ago. In both cases, my reviews appear long after the book has vanished from the shelves, though you may still be able to have your bookstore order it (or you can order on-line—try http://www.amazon.com—often at a discount).

To defeat this problem at least some of the time, I have long invited writers to send me manuscript—either on paper or on disk (MS-DOS; I can read most word processor formats; Mac users should save as rtf)—as soon as the publisher has accepted and scheduled the book. Check with me before sending manuscripts via email; even then, please compress the file before sending.

I hereby renew that invitation. Necessary contact information is in the SFWA Directory.

I also wish to extend the invitation. More and more novels are now seeing "print" in electronic form. Authors of e-books may also send me copies; they should not count on me finding their books by myself, or even on me using emailed URLs. Be warned that I generally give self-published material short shrift.

We last saw Iain M. Banks in December 1995, when I reviewed *Feersum Endjinn* here. At the time, I called him amazing and delighting. The same words apply to his latest, **Inversions,** with the added blessing that this time out he does nothing to strain our patience beyond holding his cards close to his vest.

The setting is a medievaloid world whose days and nights are paced by the movements of half a dozen moons. In

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one kingdom, the ruler is served by a doctor come from abroad with enough skills to overcome both her foreignness and her gender (women are good for only one thing, you know). Doctor Vosill in turn is served by an apprentice, Oelph, who dutifully reports on her doings—including her visit to a threatening palace torturer—to an unidentified Master. As Vosill massages and medicates the king, she also natters on, dropping hints about ways to improve the welfare of the people, pushing gently toward something we must sense as human rights and even democracy.

Elsewhere, General Urleyn is the Prime Protector of a land whose despotic emperor he overthrew some time before. He has a dedicated bodyguard, DeWar, a concubine who lost the use of an arm in fending off an assassin, and a son who tempts DeWar for stories of another land where two cousins once argued over whether the gentle or the stern touch were best suited to impelling change.

Vosill is surrounded by an old guard of men who think she needs to be removed from the king, tortured, and disposed of; fortunately, she has unsuspected resources. DeWar, being male, faces no such opposition, but Urleyn's son falls prey to convulsions and prolonged illness even as rebellious barons rise in the hills.

In the end, both Vosill and DeWar face forces against which they are helpless except to save themselves. There is a hidden connection between their lands which subverts their own efforts and—if one takes DeWar's tale of cousins as having something to do with a pair of strangers on a world of six moons—equally subverts the debate over the relative effectivenesses of gentle and stern.

If we turn a science-fictional eye on the tale, it is easy to suspect that Vosill is a visitor from space. Is DeWar also? There are fewer clues, but there is that tale of cousins and debate, and Banks clearly invites us to construct a backstory that goes far beyond the covers of his book. Will he do as much himself? Will there be a sequel? Only he knows.

Donna McMahon's **Dance of Knives** is an auspicious first novel. It is set in a Vancouver drowned as global warming has raised sea levels. The old city center, "Downtown," is occupied by refugees, many of them Americans. Local merchants and workers respectable enough to belong to guilds live in better areas nearby. City services and local manufacturing are dominated by tongs, only a little more respectable than their criminal ancestors. People are misused by a technology that involves inserting wires into their brains and reprogramming their allegiances, even their very thoughts, with ecstatic rewards and hellish punishments. At the extreme, this produces "tools," humans robbed by "training" of all humanity as they are turned into whores, spies, assassins, laborers, and other kinds of slaves.

The rest of the world is largely ignored, though McMahon provides hints that the local scene is hardly unique. Nations have broken into city-states and smaller, local communities, and as the larger economies are slowly reconstructed, they are beginning to come together once more. In Vancouver, local politics is dominated by debate over whether to support the kind of recovery represented by a West-Coast maglev transportation system. It offers advantages, but it also threatens those who are doing just fine the way things are already.

Meet Blade, a "tool" owned by the mysterious blackmailer, Mr. Choi. He's watching the waterfront as a Harbour Patrol officer picks up a smuggled package and kills her aide. He also notes the arrival of Klale, who has just left her Fisher guild (for suitable reasons) and now seeks employment Downtown. Soon she finds the KlonDyke bar/lounge/restaurant (Est. 2068), gets involved in a brawl in the name of jus-

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tice, tries a strip, and ends with the job she needs. Her boss is Toni, a troubled woman who we will soon learn has a past that involves training.

Here's Blade again, linked to Toni by mysterious bonds, behaving in ways that hint he still retains some humanity. Klale is drawn to him even as the political situation gets tenser and tenser, as corruption threatens her new home, as villains prowl and tong war and chaos loom. When she is threatened, he reciprocates, and soon Toni's past assumes a crucial role in the story. Can Blade be rehabilitated before he goes berserk? Can Downtown be protected from corrupt land-grabbers? Is there a future worthy of the name?

And who is the dancing boy on page one?

McMahon does a nice job. Her characters are fully and complexly human, and she deals with them well, even as she constructs a tale of reasonable extrapolation and satisfying suspense.

Three years ago, Brenda W. Clough gave us *How Like a God* (reviewed November 1997), in which family man Rob Lewis suddenly acquired the power to make others do his bidding. It nearly destroyed both him and his marriage, but he conquered his demons and tracked the superpower gift to the Kyzylkum Desert on the Uzbekistan-Kazakhstan border, where Gilgamesh himself lingered on. There Rob passed Gilgamesh's Pearl of Immortality to his friend Edwin Barbarossa to save his life.

And then they came home. In **Doors of Death and Life,** Rob is a family man again. He uses his superpower only to make muggers jump off a bridge and to be sure that his wife enjoys their sex life. He doesn't tell her what he's doing—he's tried that before, and when she didn't understand, he wiped her memory.

Is he a slimy scumball? He feels guilty about the muggers, but he really doesn't think so. On the other hand, when the truth comes out of the closet, his wife certainly does!

Meanwhile, Edwin has been working on a Moonbase largely controlled by private money, a large part of it belonging to Burt Rovilatt, a scumball so slimy he doesn't even know what guilt is. On the trip home, the shuttle catches fire. Edwin is the only survivor.

So now they're talking about whether Edwin murdered his crewmates, he's locked up in a clinic, doped well past his eyeballs, and it's up to Rob to bail him out. Soon thereafter, Edwin goes public with his "syndrome," becomes the center of a media circus and the star subject of a research program, and attracts an assassination attempt, which does a lot more damage to Rob than to Edwin. It takes a while before the two friends can pull each other out of trouble and put paid to the villain, but they manage it.

Superpowers can mess you up, says Clough. Their temptations aren't good for the home life, and when the greedy folks get wind of them, they're not good for their possessors, their families, and their friends. To handle them properly, you need help, perhaps even from a higher power.

Much more than most writers, Clough is giving us morality plays in science fiction guise. She makes it work, too.

Brian Stableford's latest novels have been concerned with the struggle to attain immortality. In *Inherit the Earth* (reviewed here in February 1999), he described how nanotech IT (Internal Technology) had saved humanity from a viral solution to the population crisis. To reproduce, people were using artificial wombs, and IT had stretched the lifespan impressively. In *Architects of Emortality* (March 2000), he told us that IT's limitations had been recognized and new techniques were giving rise to a "New Humanity," engineered for true immortality in the embryo.

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Both of those thoughtful and inventive novels were enlivened by vigorous plots involving strange people, murder most foul, and intriguing social and technological extrapolation.

I am less cheerful about **The Fountains of Youth.** It is abstract and intellectual, interesting in its way but unfortunately unexciting and arid. Here Stableford tells us that immortality—or emortality—has been achieved. The old, mortal humanity, even those with IT assistance, is all but gone. The New Humanity, which thinks of itself as a new species, has inherited the Earth and the Solar System, and robot probes and suspended animation arks are on their way to the stars. Life has changed, for priorities have shifted. Children are few, formed from gametes withdrawn from cold storage to be raised by families of eight or more "parents." Adults move from career to career, interest to interest, and if they choose, they can embark on projects that will take centuries to complete.

Death, of course, remains, for accidents do happen, and if New Humanity has a collective hangup it is that ancient bugbear in the boney suit. In no one is this hangup stronger than in Mortimer Gray, who as a youth survives a natural disaster that kills millions. His centuries-long project is a massive history of death and the war against it, which very quickly comes to dominate *Fountains.*

That is, you will find very little here in the way of action-adventure excitement. Stableford is surveying a new social landscape here, and from its vantage looking back on our present state. He agrees with other SF writers who have dealt with immortality that immortals will live much more in fear of death than we. He disagrees with the common contention that that fear would paralyze immortals. Indeed, his folk are grand achievers—they have more time to learn, more time to get things right, and a better shot at utopia than anyone else has dreamed.

But they do fear death, and as Gray's history effort shows, they project that fear backwards in time to say that it must have been the central feature and driving force of all earlier civilizations. Perhaps this is true (though there is also a vast amount of denial); I know some people believe so. Certainly the fear is there; equally certainly, Stableford is right to argue with all those writers who think that fear must paralyze: It hasn't yet. Why must it ever?

Nancy Kress is back with a tale of alien supertech and the mundane problem of fitting in. Prior to the time of **Probability Moon,** humanity discovered a space-gate in the far reaches of the Solar System. It gave humans access to a vast system of interconnected star systems and planets, some of which had intelligent aliens, most of them so like human beings that it seems they must all have been seeded from the same source. That's a hoary enough chestnut to make this one smell of fantasy more than SF, but never mind. The builders of the space-gates are nowhere in evidence, and folks are hieing off to explore.

Among the things they find are the Fallers, inimical and unrelated aliens who seem to want nothing more than to destroy humans and all their works. There is also World, whose people get monster headaches whenever social consensus weakens (whenever they fail to "share reality"). World has seven moons, one of which is a huge artifact left by the mysterious builders of the gates. On World, there is a strange zone of mountains, radioactivity, and neutrino emission, venerated by the locals.

And here come the anthropologists, eager to study the "shared reality" phenomenon. As soon as the ship drops them off, its crew turns to their real task: that moon, its potential as a weapon, and Omigosh, here come the Fallers! What do we do now?

Meanwhile, the anthropologists have run into trouble. "Shared reality" means a society that brooks very little in the

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way of dissent, innovation, or difference of any kind (at least until the concept of reality is enlarged). Almost by definition, humans can't possibly share reality with the locals, who are thoroughly concerned with whether humans are "real." In due time, the anthropologists are on the run into those mountains, where they find impressive mysteries that have to be connected with the artifact moon. Because these mysteries are not really resolved, there almost has to be a sequel in the works.

The star character is one of the local "Worlders." She is Enli, declared unreal because she was responsible for the death of her brother, working out her atonement and her return to reality by spying on the humans. She is peripheral to grander events, but it is her dilemma—the conflict between being an individual person and a member of the consensual group—that focuses our attention, engages our sympathies, and makes the novel work. It's a dilemma we all share, and it gives us headaches too, even if they aren't as bad as hers.

As Ben Bova puts it in his introduction to **The Essential Hal Clement, Volume 2: Music of Many Spheres**, "Hal Clement is to 'hard' science fiction as ... John Philip Sousa is to march music." Volume 1 (reviewed here a year ago) reprinted three novels *Needle* (1949), *Iceworld* (1951), and *Close to Critical* (1958), all once *Astounding* serials. This one gives seventeen short stories and novelettes, eight of them from the same magazine (including one of the very first "Probability Zero" pieces, from 1942). Most remain a pleasure to read.

NESFA is doing us all a service by reprinting the works that shaped modern SF. Encourage them by adding this one to your shelf.

Some people collect art. Fewer collect science fiction and fantasy art. Fewer still share their collections with the public. And only a very few publish tour guides to their homes.

In fact, Jane and Howard Frank may be unique. They have spent a lifetime together building a stellar collection of cover paintings, sculptures, and commissioned work. They have designed their home to show off the collection to best effect. And now they have put both home and collection on display in **The Frank Collection.**

If you have thought "science fiction art" meant the sort of display to be seen at many cons—a multitude of crowded booths dominated by amateur work—you are about to change your mind. The Franks's home is a gallery to match the best. I envy those who get to visit.

In the veins of artist Josh Kirby runs a fluid deeply stained by whimsy. This isn't obvious from all of his work, but if you look at what he has done in the way of book covers, album covers, game boxes, and posters for the Discworld craze (his patent touch has also enlivened Robert Silverberg's Majipoor tales, as well as others), the conclusion is inescapable. In his foreword to David Langford's **Josh Kirby: A Cosmic Cornucopia**, Tom Holt calls him individualistic, inimitable, "the funniest artist living." He also has such an extreme gift for making the worlds he illustrates seem enticing that I'm sure anyone who is not familiar with the Discworld will feel impelled to rush out and sample it after spending a little time with this book.

E-Books

Peter L. Manly's **Asterisms** is an appealing tale of a boy who goes with his family aboard the first starship and grows up to become the captain. Excitement is provided by a small meteorite that staves in the bow and kills fifty people, a bout with corrupt neanderthaloids, and a bit of sex, but by and large the story is a quiet thing. Manly usually writes about astronomy, com-

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puters, and aviation, and it shows; the human factor—characters and politics—tends to the stereotyped in much the way it did for Robert A. Heinlein.

I recommend getting the paper book rather than the download. The latter is cheaper, but the publisher (SF writer Michael McCollum) has chosen to present his ebooks as pdf files (for the free Acrobat Reader software), which are considerably more awkward than several alternatives. No matter which version you get, you will wish it had been through the hands of a copy-editor who knew the difference between "lose" and "loose" and "pore" and "pour."

When I was at Boskone last February, Steve Lazarowitz gave me a copy of his **Dream Sequence** collection (on CD-ROM). A few of the stories have appeared in small-press magazines and e-zines. All are of small-press caliber, meaning that they are neither horribly amateurish nor deft enough to earn a place in the major print magazines. Many are interesting enough for me to say that the author shows promise.

TOOT-TOOT!

I've just signed a nine-book deal with Wildside Press. It covers my five "organic future" novels about the future of genetic engineering (*Sparrowhawk*, which was serialized here in 1989, *Greenhouse, Woodsman, Tower of the Gods*, and *Seeds of Destiny*), a collection of related short stories (*The Electric Gene Machine*), *Unto the Last Generation* (so far available only on-line at Mind's Eye Fiction), *Unto's* sequel, *Stones of Memory*, so far unpublished, and *Gedanken Fictions: Stories on Themes in Science, Technology, and Society.* The last was originally contracted by White Wolf Books—who even paid the contributors—but they retrenched their publishing operation and reverted the rights to me. Since the original idea was to have an anthology for the students in my Science, Technology, and Society courses to read in conjunction with more academic fare, I am quite happy that now I will be able to tell them to buy copies.

By the time you see this, you should be able to order all these books from Amazon.com or your favorite bookstore.

The "organic future" novels will also be available as ebooks from Alexandria Digital Literature (http://alexlit.com).

Serendipity Systems has released ***Frontiers of Wonder***, a collection of both fact and fiction, for the Rocket eBook. You can order from Barnes and Noble(http://www.barnesandnoble.com; their search engine so far can't find the title unless you search for my name) or Powells (http://www.powells.com/rocketeditions.html).■

Human kindness has never weakened the stamina or softened the fiber of a free people. A nation does not have to be cruel to be tough.

-Franklin Delano Roosevelt

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BRASS TACKS

Dear Stan,

This is in reference to the retired police officer who pointed out that "beat cops" used to be the norm before automobiles and two-way radios. He said it made for a greater rapport and more effective policing.

Now, it started a bit before his time, and almost everyone seems to have forgotten about it, but it appears that there was a widespread corruption problem with beat cops—too many of them were a little *too* close to the local businessmen. The police reformers of the early 1940's tried moving the patrol officers off the foot beats and into patrol cars as a way of cutting down on the ease with which they could shake down the businesses on their beats. If they would have had the technology for a camera on every corner, maybe they would have instituted that instead of cars and radios—to watch the cops, not the civilians!

Well, the experiment failed, but along the way everyone forgot that it had been an *experiment* in the first place, and they never went back to foot patrolling—until the last few years, when the descendants of those police reformers brought it back as another experiment.

What goes around, comes around, it seems.

Rich Zellich
Fenton, MO

Stan,

Re: April's Efficiency Trap.

Frank Herbert tackled this problem at the government level in his excellent Jorj McKie/Bureau of Sabotage novels (*Whipping Star*; *Dosadi Experiment*). Maybe the Oxygen system needs a built-in sabotage agent?

Dr. Michael D. Rose
Newark, NJ

Dear Stan:

I must respond to Eileen Roy's letter in the April issue regarding your astute Nov. '99 editorial on surveillance cameras ("Technological Temptation"). She seems wholly persuaded that (a) surveillance cameras reduce crime; (b) privacy is a recent and corrupting invention, a cause of crime; (c) pathological social relationships will be alleviated by this technology; and (d) the freedom protected by privacy is only of benefit to white males.

Children, of course, need to be watched over. Some adults, too—because of senescence, infirmity, or other disability—simply can't arrange for their own protection. But why should rational, healthy adults be treated as wards of the state? Let's examine some rationales for that viewpoint.

Deterrence. Ms. Roy supposes a causal relation between ubiquitous surveillance in Monaco and her sister's perceptions of a low crime rate. This falls somewhat short of hard evidence. There could be more important factors deterring crime in Monaco—say, swift and certain prosecution, severe penalties actually meted out, a surfeit of bodyguards and other private security personnel, or the insistence of crime bosses that their favorite playground not be sullied by petty thug-

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gery. The plausibility of a connection between surveillance and deterrence wears a bit thin when the track record is closely examined.

Recall the two heavily-armed killers in L.A. about a year ago, shot to death by police on national TV. Fifteen seconds of fame seemed to be the only point. And the Columbine killers fantasized about having a movie made about them. Sometimes an audience actually *encourages* exhibitionist criminals.

Assume such exhibitionists are rare. Assume would-be criminals know about the cameras. Is that a deterrent? In recent years, most armed robberies of banks and convenience stores were knowingly performed on camera. Same with "smash and dash" escapades at jewelry stores and the like. Furthermore, it's not rocket science to hoax computerized surveillance. Shaving cream works; so does a good disguise. Clearly, surveillance cameras have not reliably prevented crimes.

My personal experience with this technology dates from 1980. As a pharmacist I've worked in 29 hospitals, four home health facilities, three prisons, and the INS. Sadly, those facilities with the most surveillance cameras had serious, continuing problems with narcotics theft and assaults on employees. At my first hospital internship, a fellow employee whacked out on stolen narcotics robbed a pharmacy at gunpoint. Unfortunately for us, the chief of security was incompetent—he'd been fired from both the sheriff's department and the Forest Service for theft. His background hadn't been investigated. Systems are only as good as the people who run them.

The CEO of another hospital was videoed committing a Class C felony. Despite that, and despite five eyewitnesses who saw him committing Class B felonies, plus voluminous physical evidence of additional crimes, the district attorney declined to prosecute. The CEO suffered no legal consequences.

Root out the corruption, you say? How? Certainly not by giving officials the power to eavesdrop on our criticisms and plans to expose them. Since many social crimes seem to involve pathological dominance, might not increasing the power of authority through surveillance *increase* rather than decrease the prevalence of such crimes? Why is the incidence of wife-beating among police higher than average? Not watching each other enough, I guess.

Before sallying into unprecedented invasions of the fabric of human life, we would do well to recall Lord Acton's dictum about the corrupting influence of power. Keep in mind that the 20th century was history's bloodiest. Most of the millions killed by violence were not crime victims or casualties of war, but civilians murdered by their own governments.

Police Response. Another reason for surveillance: police, alerted to a crime, should arrive and stop it. Anyone who believes they will arrive *in time* should read *Dial 911 and Die* by Richard W. Stevens. How long would it take police to arrive at your apartment if their cameras showed a break-in? (Assuming you lock your doors; otherwise they may assume the rapist is your boyfriend.) To Stevens' statistics, I'll add personal experience. Having been mugged twice, and having walked into a bank robbery on another occasion, I can tell you any response time greater than ten seconds is too long. Do you have any *idea* how much damage one human being can inflict on another in that length of time? I got a broken neck. Ten seconds later this 110-lb. woman chased the astonished mugger out the window of my apartment. It wasn't bravery—it was the only alternative to victimhood. As the only adult human walking around in my skin, my safety

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is up to me and no one else. And I *refuse* to be a victim.

Next, *arguendo*, assume the police *do* arrive before the crime is a *fait accompli*. They'll have to save you, right? Wrong. The Supreme Court ruled that you have no right to state protection (*DeShaney v. Winnebago County Dept. of Social Services*, 1989). *What?* That's right. Two other Supreme Court decisions have held that the police exist for the benefit of the community and *not for individuals.* If they're too busy or don't have backup, you're on your own. All governments, throughout history, adhere to the same policy denying that responsibility goes along with the power entrusted to them. It's known as "sovereign immunity."

Don't believe it? At Columbine, police arrived and dithered for *four hours* while the carnage continued. Once the pimple-faced perpetrators finished and killed themselves, the long arm of the law was Johnny-on-the-spot stringing crime scene tape.

Next: How many cameras would be required to stop crimes like wife-beating and child abuse? Few of these are committed in public; you'll need cameras in every home. Say, one for every room? How many cameras can one policeman monitor and respond to effectively? I figure that, even using motion detectors to avoid monitoring empty rooms, a city like Phoenix will need about 100,000 people monitoring its million inhabitants. For quick response, we'll certainly need a dozen officers per square mile (tough luck if you live in the country)—unless their only job is to draw chalk lines around the corpses and interview survivors. Can even the wealthiest society in the world afford to have so many watching, incarcerating, and therapizing the rest?

Let's review the situation. Your only hope when attacked is that police are practically right next door and willing to go above and beyond the call of duty. Neither of these usually obtains. The outcome is up to *you*.

Privacy. Privacy is indeed a relatively new invention. So is individual liberty. Given that such liberty is the only plausible explanation for the dramatic success of Americans over two centuries, it is foolhardy to discard it in order to conform to the rest of human history.

Before government, a lack of privacy was generally accepted *voluntarily* for economic and social reasons. Tribal folks living elbow-to-elbow could leave whenever they chose. If the pro-camera folks get their worldwide surveillance, however, the rest of us don't have off-world colonies to escape to. As Jim Hogan said, "You can't vote with your feet when there's nowhere to go."

What do you call a closed system with no safety valve?

Privacy is our safeguard against government abuse. It is not explicit in our Constitution, but implicit. The sole purpose of the Constitution was to limit the scope of government, enumerating exactly those few powers it would be entrusted to exercise, prohibiting all other activity. Our government is not authorized to snoop on peaceful individuals.

An ever-watchful Big Brother, far from being the guarantor of personal security, is its worst enemy. The obvious question, then: What other option is there?

Absent government interference, in a free society a would-be predator can never know whether an intended victim, or any bystander, might *really* ruin his day. But why be the Land of the Free and the Home of the Brave, when freedom requires vigilance and bravery is so uncomfortable to acquire? We'd rather be the Land of the Lotus Eaters. Let the hired help do the dirty work, and don't worry that they might someday turn on you.

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Ms. Roy wants the liberties of a man—to move about unmolested whenever and wherever she chooses—without the responsibilities. Lost privacy seems a small price to pay. But you *are* responsible for your life, whether you wish to be or not. The cost of abdicating that responsibility is higher than taking it. My mother picked the wrong man to run her life. His abuse was primarily psychological, sending her on the long dive down into one mental institution after another. She didn't survive it.

I saw very early that my handsome, charming father could not be fixed by anyone, and that the passivity women often resort to is a form of death.

I have fought all my life for my freedom, and it requires privacy. These are not luxuries. They're necessities.

Fran Van Cleave
Spencer, IN

Dear Dr. Schmidt:

Your editorial, "The Efficiency Trap" dealt very convincingly with the dangers inherent in too rapid decision-making. Personally I have made it a rule never to make an important decision without sleeping on it and have only regretted the times when I have broken it.

However, I am afraid my observations of drivers talking into their cell phones leads me to a more cynical expectation of the outcome from the situation in which a worker in France notifies her boss in New York about a site for a new office. He, in turn, assembles a team of a jogger, a car driver, and a man at home to make a recommendation in six hours as to the project's feasibility.

I suspect that the outcome would be as follows:

The jogger, deep in conversation with the worker in Paris, neglects to look both ways while crossing the street. The car driver, immersed in getting a site plan of the building, doesn't see her in time and runs into her. He then loses control and the vehicle skids into oncoming traffic where it strikes the car of the New York boss who is taking a few minutes off with his mistress. She is the wife of the man at home who has been kept so busy that he has been neglecting her to the point where she is starved for affection. When notified of the accident, he commits suicide.

The resulting scandal causes a run on the company's stock which loses so much value that the bank forecloses, and fires all the workers, including the employee in Paris.

Pete Fowler
Bridgewater N.S. Canada

Dear Mr. Schmidt,

Some thoughts on the Efficiency Trap.

First, what you describe in your editorial actually isn't it: what you describe is Extra-High Speed TechnoGubbins (sorry, the Oxygen project)—a techno-solution to a problem that not only doesn't exist, but has already been 'solved' by the wonders of the mobile phone, the computer, the face-to-face meeting. . . However, there will no doubt be technofashion victims who will buy it, play with it, change the default settings, use it ostentatiously in restaurants, find it's more trouble than it's worth except for booking restaurant seats, switch it off and forget all about it when the next piece of technogubbins comes along.

In the immortal words of whoever it was, if your systems didn't work properly before you got your computer, all your computer will do is speed up the mess. If your business is so badly run that you have to close the deal for a new office within six hours, all the technogubbins will do is allow the idiots who got themselves into the mess in the first place to talk self-importantly at each other while cannoning into

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other joggers. In other words, the splendors of the market-place will soon see to it that they and their technogubbins will lose their jobs.

But there is a real Efficiency Trap and it's related to the Adaptability Trap.

A wolf is a very highly specialized and efficient carnivore and does splendidly so long as the environment for which it is specialized doesn't change very much. A rat is a fairly unspecialized and not shiningly efficient omnivore which can't possibly compete with a wolf on its own ground. But if the environment suddenly changes, as in those ugly upright apes arriving, just watch the wolves die out and the rats do well.

Efficiency tends to be lean and mean—energy sparing, well-adapted/designed for its purpose and thus unable to use other options. Often it's rather beautiful. Adaptability tends to be wasteful and designed not to be too good at anything but OK at most things. Generally a bit ugly. Pit adaptables against efficients in a stable environment and the efficients wipe the floor with them (hence the Adaptability Trap). Pit efficients against adaptables in an unstable environment and it's bye-bye efficients (hence the Efficiency Trap).

This applies to companies as well, of course. General Motors was very efficient at turning out big handsome fast gas-guzzlers and did very well until the environment suddenly bloomed with people who wanted small ugly gas-sipping cars. You can fill in more examples for yourself. In human affairs, things often start out small, ugly and adaptable and end up big, efficient and slow.

All management consultants should have the following tattooed on their foreheads: Neither style, by itself, is always the right answer. Generally speaking, though, the more efficient an organism, the less adaptable it is and the more adaptable, the less efficient.

Ideally, of course, an organism should come up with a way of being both adaptable and efficient: I could invent some splendid new word (adapticient? effaptable?) but I believe the word already exists and does the job just fine.

I think the word is "intelligent."

Oh and by the way, thank you so much for your splendidly off-the-wall-noir lead story "Obsidian Harvest" by Rick Cook and Ernest Hogan. Ever since I read "Down Styphon!" by H. Beam Piper I've been a big fan of alternate history stories—let's have some more, please?

Patricia Finney
Cornwall

Stan,

I love baseball and love a good baseball story almost as much as the real thing. A good Science Fiction baseball story is indeed a rarity and James Van Pelt's "The Comeback" in the April, 2000 issue was just that: a good Science Fiction baseball story.

However, baseball is a game of statistics and numbers. When you quote from the canons of baseball history it's important to be spot-on accurate. If you're not, the purists will kill you. Hence I hasten to correct two factual errors in Van Pelt's story. First, it was Joe Tinker and Johnny Evers, not the reverse as appeared in the story. Second, I doubt that a single Mets or Red Sox fan (for different reasons!) will ever forget game six of the 1986 World Series. None of us will forget that the Buckner bobble took place in the tenth inning, not the ninth.

Other than that, a great, great story. The best since Poul Anderson's Hoka story of many years ago which added a few meaningful stanzas to Casey At the Bat.

Ira Stoller
Butler, New Jersey

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When we got your note, we'd already received the following from the author . . .

Dear Stan,

I received my contributor copies of the April Analog yesterday, and "The Comeback" looks great.

Then I got an e-mail from Shane Tourtellotte congratulating me on the story and pointing out a mistake I made. One of the sources I used for the story said Bill Buckner booted a ground ball in the last inning of the game to lose the contest. I put in the story it was the 9th inning. It was the 10th. I didn't get the detail accurately.

In my experience, SF fans nail writers for facts that are wrong, but the SF fan's wrath pales in the face of a baseball fanatic who catches a mistake.

I'm afraid I'll forever be the writer who muffed Bill Buckner's ground ball in *Analog*.

Apologetically yours,
Jim Van Pelt

Dr. Schmidt

I put it to you that it can scarcely be considered "efficient" (as you did in April) to reach bad conclusions in haste through ignorance or stupidity. Where ignorance is the lack of needed facts, and stupidity is the neglect of facts at hand. Can quick blunders *ever* be thought efficient?

What you said is hardly new, it is centuries or millennia old: "Haste makes waste," "More haste, less speed," and the like. Not only not new, not interesting either. Equipping old saws with cell phones and the Internet changes their content not one whit, or wit. Is not your editorial itself an example of the "efficiency" you derided?

Ignorance and stupidity aside, there is another aspect of mind which can make efficiency a seeming evil, but only seeming. This is a person's Schizoid capacity to uphold contradictory ideas and ideals. One set of ideas, used logically and consistently and efficiently, then quickly leads to ends from which the other recoils in horror. And logic, reason, and efficiency take the blame. Standard Procedure for the poor workman and the half-mad: blame the *tools*. Examples? City planning principles vs. their results (read Jane Jacobs); the Third Reich, built on religious ethics, and its results (read Leonard Peikoff); or *any* religious tenet, and its consequences (*look anywhere*).

Efficiency has nothing to do with it; it is your own ignorance or stupidity or madness that is to blame. Remember Spock: *Remarkable how often you humans achieve that which you did not want.*

Sincerely
Douglas L. Houser

Yes, mistakes can be made efficiently. I'm using the word in something very close to its strict physical sense, to mean producing a high ratio of effect to effort. Whether the result is beneficial or detrimental is a completely separate question. ■

The first key to wisdom is constant and frequent questioning, for by doubting we are led to question and by questioning we arrive at the truth.

-Pierre Abélard

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UPCOMING EVENTS Anthony Lewis

29 September—1 October 2000
ARCHON 24 (downstate Illinois SF conference) at Holiday Inn & Gateway Ctr., Collinsville Ill. Guest of Honor— Larry Niven; Artist Guest of Honor—Larry Elmore; Fan Guests of Honor—Genie Yaffe, Amy & Dave Verseman. Registration: $30 until 31 August 2000, $35 at the door. Info: Archon 24, PO Box 8387, St. Louis MO 63132; +1.314.326.3026; e-mail: archon_info @zellich.net; URL: www.stlf.org/archon/24

29 September—1 October 2000
TRINOC-CON 2000 (North Carolina SF conference) at Marriott & Civic Center, Durham NC.; Guest of Honor—Michael Swanwick; Special Guest—James Morrow; Artist Guest of Honor—Charles Vess; Gaming Guest—Skip Williams. Registration: $25, higher at door. Info: Trinoc-con, PO Box 10633, Raleigh NC 27605; e-mail: Trinoc-con@aol.com; URL:www.trinoc-con.org

7—9 October 2000
ALBACON 2000 (Albany area SF conference) at Ramada Inn, Schenectady NY. Guest of Honor—Glen Cook; Artist Guest of Honor—Joe DeVito; Fan Guest of Honor—Jan Howard Finder. Registration: $38 until 28 September 2000, $45 at the door. Info: Albacon 2000, Box 2085, Albany NY 12220; URL: www.albacon.org

26—29 October 2000
WORLD FANTASY CONVENTION 26 at Omni Bayfront, Corpus Christi, TX. Guests of Honor—K. W. Jeter, John Crowley; TM—Joe Lansdale. Registration—$105 until 15 October 2000, then more. Info: WFC 2000, Box 27277, Austin, TX 78755. +1.512.835.9304 (voice), +1.512.835.7637 (fax), e-mail: fduartejr@aol.com URL:http:// 2000.worldfantasy.org

30 August—3 September 2001
MILLENNIUM PHILCON (59th World Science Fiction Convention) at Philadelphia Marriott, Philadelphia, Penna. Guests of Honor — Greg Bear, Stephen Youll, Gardner Dozois, George Scithers, TM—Esther Friesner. Registration—$135 until 29 April 2000; $145 thereafter [rates may go up]; supporting $40. [These are the latest rates posted on the Internet as of the time this column went to press.] This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Info: Philcon, Box 310, Huntingdon Valley, PA 19006. e-mail: philcon2001@netaxs.com URL: http://www.netaxs.com/~phil2001.

Convention runners: If your convention has a telephone, FAX, email, or Web Page URL, please let us know so that we can publish this information.

Convention attenders: When calling conventions for information—do not call collect and do not call too late in the evening. It is best to include a S.A.S.E. when requesting information; include an IRC if the convention is in A different country. ■

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